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SUMMARY OF RECENT ABSTRACTS *

IX. LEPROSY

General

The textbook on leprosy by ROGERS and MUIR (p. 339) has been brought up to date by the publication of an addendum on treatment.

A pamphlet on leprosy in the Gold Coast, issued by the Society of Friends of Lepers, is reviewed on p. 625. It is intended for the instruction of the general public.

Classification

At the Pan-American Leprosy Conference in Buenos Aires in 1951 (p. 870) the classification of leprosy into Lepromatous, Tuberculoid and Indeterminate categories was suggested. COCHRANE (p. 409) suggests a modification of the South American classification, commenting that the Indeterminate group is confusing. He suggests that the term Tuberculoid should be confined to cases with a more than slightly positive Mitsuda reaction, and in which the granuloma is continuous up to the epithelium. His classification is as follows:—

Lepromatous Leprosy
- Preleproma (pl)
- Macular leproma (Lm)
- Diffuse leproma (Ld)
- Infiltrative leproma (Li)
- Nodular leproma (Ln)
- Polyneuritic (Lp)

Tuberculoid (Lepride)
- Maculo-anaesthetic (Tm)
- Minor lepride (Te)
- Major lepride (TE)
- Polyneuritic (Tp)

Epidemiology

A report on the prevalence of leprosy throughout the world has been compiled by PIZZI (p. 962) for WHO. He points out that information is often incomplete, important data having been omitted, such as age and sex distribution and the type of disease. It seems that lepromatous leprosy is relatively more common in America than in Africa, which may be taken to indicate that the infection is older in Africa.

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1952, v. 49. References to the abstracts are given under the names of the authors quoted, and the pages on which the abstracts are printed.

Cochrane (p. 1124) discusses leprosy and its history in the British Isles, and calculates that there are at present about 150 cases in England and Wales, all acquired outside the country. Many patients seek refuge here and the disease is not easy to detect; the numbers may therefore increase. Leprosy is now notifiable. He refers to the Ministry of Health Home in Surrey.

A few cases of leprosy still exist in Norway, and Melsom (p. 516) reports three patients discovered in 1951 who were siblings and whose mother had had the disease. A case of leprosy in a hotel chambermaid who had never left France is described by Joulia *et al.* (p. 403).

Hens Tienda and Fernández Nafria (p. 871) sum up the leprosy position in Spain where there are some 2,243 cases and 10,682 contacts, and where about 1,600 beds will soon be available in various institutions. All open cases should be isolated in institutions.

Muraz (p. 411) estimates that there are 200,000 cases of leprosy in French West Africa, of whom only 34,000 are receiving treatment, mostly with chaulmoogra. Poindexter (p. 627) gives an account of leprosy in Liberia, where there are 4 colonies.

Abbott (p. 403) reports that leprosy was found in 46 per 1,000 of the Azande of the Southern Sudan, but that 80 per cent. of the cases were of mild neural type showing either tuberculoid lesions or simple macules. Only 5 per cent. had lepromatous disease. In part of Uganda Wheate (p. 404) found leprosy in 47 per 1,000 of the group examined but doubts if various age-groups were adequately represented in the sample. Incidence was highest in areas of high humidity and density of population, but high incidence was associated with close contact, though not with malnutrition or a low standard of personal hygiene. In a survey of Zanzibar and Pemba Innes (p. 963) found the incidence of leprosy to be 3·9–5·5 per 1,000, with 21·8 per cent. of patients under the age of 14. The lepromatous type was found in 18 per cent. of the patients, and elevated tuberculoid lesions in 60 per cent.

Leprosy in Indonesia is said by Boenjamin (p. 404) to be an even greater problem than it was before the war, and there are now fewer doctors working on it.

An epidemiological study of leprosy in an isolated community in the Philippines is reported by Guinto *et al* (p. 54).

Leprosy was introduced into the island of Nauru in 1911 and spread so that in 1930 about 35 per cent. of the population of 1,300 were affected. By isolation and treatment the number of cases was greatly reduced by 1941, and remains low. Wade and Ledowsky (p. 963) comment that this epidemic was unique in the extent and rapidity of spread and in the prevalence of maculo-anaesthetic forms and the good results of treatment with chaulmoogra; some other factor of innate resistance was probably operating, which may have been different from resistance to first infection.

Ragusin (p. 626) gives an account of leprosy in New Caledonia.

From a survey of leprosy in aborigines of the Northern Territory of Australia Humphry (p. 871) estimates that there are about 400 cases.

Leprosy exists in Canada, and there are two special hospitals for the few patients, one in New Brunswick and one in British Columbia. Brown (p. 1047) gives a historical account of it.

The incidence of leprosy in Brazil is calculated as at least 1 per 1,000 by Risi (p. 405) who gives an account of the situation and of the 36 residential institutions and 85 dispensaries for leprosy, which are inadequate to meet the needs. Quagliato (p. 406) gives an account of leprosy in the State of São Paulo, Brazil, classifying the cases according to race. Leprosy

is a very serious problem there, and 2,100 patients were recorded in 1950; PUPO (p. 874) shows that half or more are lepromatous.

BROWN (p. 962) has published a survey of Catholic leprosy work throughout the world.

Aetiology

WHEATE (p. 279) describes morphological changes which occur in leprosy bacilli after treatment with sulphones, and MALFATTI and JONQUIÈRES (p. 775) have used the electron microscope to study these changes. Other electron microscope studies have been made by HAEDICKE *et al.* (p. 966).

Exposure of the leprosy bacillus to sunlight or other rays for short periods will significantly alter its acid-fast property, but with the same exposures the rat leprosy bacillus is unaffected. MUKERJI (p. 517) suggests that this test may be used to distinguish the organisms.

SATO (p. 1125) failed to observe growth of leprosy bacilli in various media, as had been reported by certain other workers, but ALEXANDER-JACKSON (p. 55) has cultivated, from the blood of leprosy patients, pleomorphic organisms in the form of non-acid-fast granules and rods and other types, including occasional free acid-fast granules and rods, which she thinks may be forms of the true leprosy bacillus. She describes the media used, which are simple, and points out that blood from controls did not give rise to these forms. The work should be easy to repeat. DE SOUZA-ARAUJO (p. 155) describes two cultures of an organism which he believes to be *Myco. leprae.*

An acid-fast bacillus which is probably not the leprosy bacillus was isolated from a human leproma by MARIE-SUZANNE *et al.* (p. 55) who describe its character. In an attempt to cultivate *Myco. leprae* ROW (p. 155) has grown an acid-fast organism in symbiosis with *Leishmania donovani* and in bacteria-free metabolites of *Myco. tuberculosis.*

MARIE-SUZANNE *et al.* (p. 522) inoculated various acid-fast organisms into white rats and compared the histological changes produced. Bacilli from a leprous nodule, and a culture from leprous tissue, produced identical tuberculoid and lepromatous lesions, which were not provoked by the paratubercle bacilli.

By injecting acid-fast bacilli cultivated from leprosy patients into the skin of 30 patients with leprosy DE SOUZA-ARAÚJO and DE SÁ (p. 773) provoked the Koch phenomenon.

HANKS *et al.* (p. 280) have studied the hydrogen transfer capacity of mycobacteria.

Transmission

Discussing infection by accidental or deliberate inoculation of leprous material in man, DUBOIS (p. 965) quotes instances which suggest that such infection is not easily obtained. He thinks that most people have strong resistance to infection, but a few seem to be very receptive to it. Discussing the possibility that leprosy may be transmitted by mosquito bite MONTESTRUC (p. 518) describes a child of a mother with lepromata, in whom acid-fast bacilli were found in erythematous zones caused by mosquito bites; the bacilli disappeared in a few days.

Pathology

In an extensive study of the histology of early lesions in leprosy KHANOLKAR (p. 56) has found appearances which suggest that the leprosy bacilli enter the axonal spaces of the nerves. He holds that they can pass

through the unbroken skin, after which they seek out the fine nerve twigs in the superficial dermis; the nerves, not the lymphatics, form the path of the bacilli, and the original foci lie in these nerves. The bacilli are particularly attracted to degenerating and regenerating nerve twigs, and parts of the body liable to injury therefore suffer more from leprous lesions than others, and children are particularly susceptible to injury. To be effective, therefore, drugs must reach the axonal substance. In comment, Muir remarks that the evidence that the bacilli seen were actually in the axonal substance, which is a revolutionary idea, is far from satisfactory.

Histological examination of primary lesions of leprosy in Culion children showed tuberculoid changes in most, and leprosy bacilli in half. Nolasco (p. 773) in one child examined after death found bacilli only in the lymph nodes corresponding to the primary lesion; spread is apparently by the lymphatics through the agency of large monocytes. A study of the capillary picture in leprosy is reported by Gallego Burín (p. 406).

Barnetson (p. 407) describes the bone changes in neural leprosy, which he divides into 2 categories. Primary changes are due to destruction of vasomotor fibres, and secondary changes are the result of multiple small injuries.

Wade (p. 519) discusses the latent period in leprosy, and the possible places (nasal muscosa, superficial lymph nodes, and skin) where the bacilli can remain during that period.

Examination of tissues and smears

Figueredo and Desai (p. 57) found that a large number of clinically negative contacts of leprosy patients were bacteriologically positive, and claim that their method of taking skin biopsies so as to include fatty tissue increases the positive findings. Most of these positive contacts showed positive lepromin reactions, but the more bacilli found, the weaker the reaction. It seems therefore that when bacilli first enter the body they sensitize the patient, whatever the type of leprosy which develops later, and early leprosy may be divided into three stages—positive contacts, primary lesions and persistent lesions. They (p. 966) show that by removing a wedge-shaped piece of skin in cases of neural leprosy, and in contacts, the chances of finding leprosy bacilli are greatly increased if the following procedure is adopted. The skin is soaked in chloroform and acetone for 4–5 hours, then pressed until it is flat, and discarded. The chloroform is evaporated and sulphuric ether is added and decanted after centrifugation. Bacilli, which cannot be found by more usual methods, are often present in the sediment.

Khanolkar (p. 155) describes his careful method of taking biopsy specimens (to include fat), for details of which the original should be consulted. Khanolkar and Rajalakshmi (p. 1048) concentrate acid-fast bacilli from biopsy specimens by crushing the tissue in 1 per cent. acetic acid until a milky emulsion is formed, and shaking with a mixture of petroleum ether and sulphuric ether, in which the organisms are found on standing. This procedure led to discovery of the bacilli in cases negative by ordinary methods; controls were negative except in one case in which a specimen was taken near a fungating cancer, and in which contaminating acid-fast bacilli were found.

Maddock (p. 518) writes of the efficiency of the Wayson method of taking skin scrapings for leprosy bacilli, making the point that no fatty subcutaneous tissue should be included. In comment Muir points out that in

Khanolkar's opinion it is essential to include subcutaneous fatty tissue for histological examination.

Azulay (p. 1127) prefers histological examination to smears.

Azulay and de Andrade (p. 1127) found bacilli in biopsies from 51 per cent. of reacting tuberculoid cases.

Wade (p. 626) makes the point that in the process of preparing tissues for section by the paraffin technique there is a tendency to remove the acid-fastness of leprosy bacilli, and he discusses a method of embedding in carbowax which avoids this difficulty.

Wilkinson (p. 56) has found that by treating smears with peroxide before applying the usual Ziehl-Neelsen stain he obtained more positive results in people who have been treated with sulphones.

Immunity

Floch and Destombes (pp. 154, 405) discuss leprosy in the penal settlement of French Guiana (now closed) and point out that it was more common and more severe in the Europeans than in the other races. They discuss the possibility of immunity to both leprosy and tuberculosis, and of vaccination with BCG.

No evidence was found by Boenjamin (p. 57) that any correlation exists between vitamin C deficiency and susceptibility to leprosy.

Lepromin test

Neyra Ramirez (pp. 1125, 1126) differentiates the immediate response to lepromin (a hypersensitivity reaction known as the Fernández reaction) from the late response (Mitsuda reaction, which is held to be an expression of immunity). He states that lepromatous leprosy depresses the tuberculin reaction but that tuberculous infection sensitizes to the lepromin test, and BCG vaccination also produces a positive lepromin reaction. He proposes to use BCG in contacts and residents in endemic areas. Neither the early (Fernández) nor the late (Mitsuda) lepromin test is affected by antihistamine drugs; Guimarães (p. 1127) therefore considers that the allergy demonstrated by the former must be of tuberculin type, which is not susceptible to the action of antihistamine drugs.

The lepromin reaction is usually the same whether performed in the normal skin of leprosy patients or in the centre of the lesions, but in tuberculoid cases stronger reactions tend to occur more frequently inside the lesions (Basombrío *et al.*, p. 57).

Floch (p. 875) shows that patients with tuberculoid and undifferentiated leprosy were mostly positive to injections of lepromin and also BCG, and that some lepromatous patients reacted to BCG. He discusses cross allergy and cross immunity provoked by *Myco. leprae* and *Myco. tuberculosis*. Passos *et al.* (p. 1126), on the strength of a test in 20 tuberculous patients with weak Mitsuda reactions, contend that administration of BCG by mouth on 3 occasions at intervals of one week tends to render the subjects more strongly reactive to lepromin.

In the indeterminate form of leprosy, treatment with sulphone tends to convert a negative to a positive Mitsuda reaction, and Floch (p. 1130) regards this as reflecting an increase in resistance to the infection.

Tisseuil (p. 961) has written a treatise on leprosy in which he discusses the Mitsuda reaction, and questions of immunity and control, in his own individual way. It should be read in full.

De Faria (p. 407) reports the response of dogs to injection of an antigen composed of a suspension of leproma; all gave a late reaction after 7–21 days.

Serum tests; Chronaxy

Olmos Castro and Bonatti (p. 408) have attempted flocculation and complement-fixation tests in leprosy with an antigen extracted from lepromatous tissue. The flocculation test was positive in 73·5 per cent. of lepromatous cases but in only 4·8 per cent. of tuberculoid cases and 3·7 per cent. of contacts. Serological tests may be valuable in deciding to grant conditional parole to lepromatous patients.

Changes in the pattern of serum proteins in leprosy are reported by Chakravarti (p. 155) and by Ross and Gemar (p. 627), who found increase in the serum globulin fractions (especially gamma globulin), in moderately and far advanced lepromatous disease, and by Arcuri and Inzerillo (p. 699) who found a tendency towards normal amounts after treatment with thiosemicarbazone.

It is well known that false positive tests for syphilis are common in leprosy; they have been discussed by many authors. In 154 patients with positive tests Schmid and Thillainathan (p. 409) found only 6 who actually had syphilis. Kvittingen *et al.* (p. 967) found that the Meinicke test gave fewer false results than the VDRL or Kahn, and Kvittingen (p. 967) shows that the reactions are at low titre, and that such false positive sera can be rendered negative by heating the sera for 5 minutes at 65°C., which will not alter the reactions with true syphilitic sera. Gollerkeri *et al.* (p. 1049) found false reactions most common in patients with high bacterial counts and negative lepromin tests, and Portella and de Almeida (p. 1128) found discrepancies in results with cardiolipin and sitolipin antigens; they think that false positive reactions are due less to want of specificity in the phospholipids than to the techniques employed.

Chronaxy may be altered in leprosy without signs of cutaneous or neural involvement, and this may indicate that the nerves are affected for some time before there is palpable thickening. Dubois and Rademecker (p. 408) suggest that examination of chronaxy may be useful in early diagnosis or as a test of cure.

Clinical findings

A patient with the Lucio form of leprosy, with large ulcers of the legs in patches of hard, infiltrated skin, is described by Fiol and Jonquières (p. 519).

Maxwell and Kao (p. 963) write of peculiarities in leprosy seen in Eastern China, where the disease has recently increased. They note that all patients with lepromatous leprosy show alterations of sensation from the beginning. Ghosh *et al.* (p. 520) discuss nose and throat lesions in lepromatous leprosy. Dharmendra *et al.* (p. 520) describe 8 cases with localized macular lesions clinically not of lepromatous type but bacteriologically and histologically lepromatous. They suggest that this type of lesion may be responsible for the view that patients with tuberculoid lesions are occasionally negative to lepromin. Portugal (p. 873) reports on a case in which histological examinations at various times showed both tuberculoid and lepromatous changes; this type of case is becoming more widely recognized throughout the world.

Gómez Orbaneja (p. 628) discuss tuberculoid leprosy and its subdivision.

Atrophy of the testes is relatively common in leprosy, but the ovaries are not similarly affected (Grabstald and Swan, p. 1128).

Lepra reaction

Souza Campos (p. 873) distinguishes between tuberculoid lepra reaction which shows reaction from the beginning, and reacting tuberculoid leprosy which is a reacting phase in the course of the ordinary tuberculoid disease.

Sampaio *et al.* (p. 873) and Roche *et al.* (p. 58) show that the lepra reaction tends to respond to ACTH, which seems to remove the harmful effects of hypersensitivity without interfering with the process of immunity. To avoid lepra reaction in the early stages of treatment Floch (pp. 1130, 1131) advocates intramuscular injection of sulphones, and possibly combination of monosubstituted sulphones with DDS or thiosemicarbazone, and the use of vitamin preparations.

Treatment and Control

In the *Leprosy Review* (p. 628) there is a statement on treatment with sulphones, issued by a group of experienced workers. It was agreed that complications of sulphone treatment were usually due to excessive dosage. Sulphetrone should be injected up to a dosage of 3·0 cc. of a 50 per cent. watery solution twice weekly. DDS by mouth may be given to a maximum of 400 mgm. twice each week. Streptomycin and thiosemicarbazone may be useful and BCG has given promise in control.

Lowe (p. 629) has contributed a long paper on sulphone therapy. He points out that the therapeutic blood level of DDS is as low as 0·2 mgm. per cent. and that this is attained when the complex sulphones are given in the usual doses, so that it appears unnecessary to postulate any additional action of the undegraded complex sulphone. When disubstituted sulphones are injected, however, very little DDS is produced in the body, and it is possible that their activity is partly due to the production of monosubstituted sulphones, which are active. The maximum well-tolerated oral dose of DDS is 200 mgm. per day or 500 mgm. twice weekly, but the minimum therapeutic dose (in a test carried out by Lowe) was 30 mgm. daily. The optimum treatment is with doses rising slowly to 400 mgm. twice weekly, and at this figure the blood concentration is about 0·8 mgm. per cent. after administration, falling to about 0·3 mgm. before the next dose. It is possible that smaller doses—200-300 mgm. twice weekly, or 400-500 mgm. once weekly—may give equally good results. DDS is almost completely absorbed and 85 per cent. appears in the urine, but although absorption is rapid, excretion is slow, and this makes it economical; high doses, however, may be dangerous. Safe blood levels are from 0·2 to 1·0 mgm. per cent., and acute toxicity is seen at levels of 2·0 mgm., for which 2,000 mgm. of DDS a week are required. There is considerable margin between therapeutic and toxic doses.

Cochrane (p. 774) makes the point that the changes (fragmentation, etc.) which occur under treatment with sulphones make it more possible for bacilli to be phagocytosed. In tuberculoid leprosy the response to sulphones appears to be in proportion to the reactions provoked, but sulphones should not be given to patients in the reaction stage. He warns against injudicious or inadequate mass treatment.

Ross and Gemar (p. 58) have examined the blood and urine concentrations of free and hydrolysed sulphones in patients treated with various preparations.

De Souza-Araújo (p. 521) has applied sulphones to cultures of acid-fast organisms isolated from leprosy patients, and concludes that they do not show bacteriostatic action.

Floch and Nomdedeu (p. 699) show how sulphone treatment has increased in French Guiana between 1946 and 1951, and report that in moderate and incipient cases specific lesions have disappeared under treatment in 53 and 66 per cent. of cases respectively, but only in 8 per cent. of very advanced cases (which were the majority).

Summing up modern practice, Chaussinand (p. 520) concludes that DDS is the drug of choice for effectiveness, simplicity of administration, and cheapness. Muir (p. 774) emphasizes the profound change in prognosis which has followed the introduction of the sulphones. DDS has advantages over other sulphones, and the author refers to the use of vitamin B12 in controlling the reaction-anaemia complex which sometimes occurs when it is used. Garrett (p. 156) claims that DDS treatment is practicable on a mass scale in out-patient clinics with very little supervision, provided that a small dose (up to 400 mgm.) is given twice each week. He treated 9,000 patients in Nigeria in this way, and 3 per cent. developed dermatitis and a few patients (who had received higher doses) developed psychoses. He claims that this is no more dangerous than administration of hydnocarpus oil, and much more effective. Roy (p. 411) thinks that in most cases DDS can be given in doses of 50 to 150 mgm. daily without special attention or special diet. He analyses his own results which showed improvement in three-quarters of the patients in periods up to 2 years. He (p. 968) also gives DDS as a 20 per cent. suspension in hydnocarpus oil; he injects 1 cc. subcutaneously twice each week. The results are favourable.

Floch (p. 968) recommends DDS, injected subcutaneously in suspension in agar-saline solution (dose 1·2 gm. once a week), or orally in doses of 600 mgm. once a week or 400 mgm. twice. These are maximal doses, to be attained gradually. Floch and Lecuiller (p. 874) claim that after a dose of 400 mgm. DDS by mouth only a trace is found in the blood on the third day, but after 800 mgm. there was 0·2 mgm. per cent. in the blood on the eighth day. They found that 800 mgm. once a week was well tolerated if it was gradually reached by slow stages. This might be alternated with injections of 1·2 gm. of DDS in 10 cc. of a 2 per 1,000 agar-saline solution once a week. Succinyl DDS (1500 F), given by mouth, is transformed so that only 40 per cent. is recoverable from the blood in the original state, but when given by intramuscular injection only a trace is transformed (Floch *et al.*, p. 279). Floch and his colleagues (p. 278) state that when DDS is given by intramuscular injection it can be recovered unchanged from blood and urine, but that when it is given by mouth 20 per cent. is changed to an unstable derivative, possibly when passing through the liver. Oral DDS led to lepra reactions in 47 per cent., but intramuscular DDS in only 8 per cent. They (p. 277) favour the administration of DDS by intramuscular injection of 1·2 gm. once each week, and after experiments with various vehicles they prefer a suspension in 10 cc. of agar-saline; they give details of preparation of this.

Barnes and Barnes (p. 157) have seen cases of hepatitis developed in the course of treatment with DDS.

The monosubstituted sulphone known as 1087 MM is recovered from the blood unchanged but may be transformed in the kidneys (Floch and Lecuiller, p. 158); its action in leprosy is similar to that of other sulphones (Floch, p. 158). Propiosulphone is a water-soluble monosubstituted sulphone, quickly absorbed and quickly eliminated, but after a trial Herrera (p. 631) concludes that in doses up to a maximum of 3 gm. daily by mouth it has an excellent effect in infectious leprosy. Tolerance is good.

In a survey of results of treatment of leprosy with Diasone reported from institutions in many parts of the world, KELLERSBERGER and RULE (p. 410) show that most of the results were very gratifying. Promin, with autoserotherapy, produced good results in a series of patients treated by JUCOVSKY (p. 411). FLOCH *et al.* (p. 1129) state that when taken by mouth, 3 gm. of sulphetrone are equivalent to 200 mgm. DDS. The amount absorbed is very variable, often not more than 50 per cent.

GATÉ (p. 631) writes favourably of a disubstituted derivative combining the fatty acids of chaulmoogra oil with DDS, and TZANCK *et al.* (p. 1129) of two new disubstituted sulphones, which they tried in one patient.

FLOCH and HORTH (p. 874) refer to the value of nicotinic acid in cases of intolerance to sulphones and in the lepra reaction.

A considerable test of the value of thiosemicarbazone in lepromatous and tuberculoid leprosy, in doses up to 150 mgm. daily, indicated to LOWE (p. 632) that it gave results similar to those obtained with DDS, with fewer complications. It is, however, less simple to give, and is more expensive. KEIL (p. 631) thinks that it gives good results more rapidly than the sulphones, and is better tolerated; the optimum dose rises to 100 mgm. daily. Most observers think that thiosemicarbazone forms a useful substitute for the sulphones when the latter are badly tolerated or are not acting well, and FLOCH and HORTH (p. 158), MONTESTRUC and BLACHE (p. 1131), ORBANEJA *et al.* (p. 1131) and SCHUJMAN (p. 968) write to this effect.

BOLGERT *et al.* (p. 279) report unfavourably on PAS in leprosy.

Three lepromatous patients treated by SECRET (p. 1131) with isoniazid responded so well that he thinks that further trials are justified.

Administration of dihydrostreptomycin to patients suffering from lepra reactions seemed to reduce its intensity and lead to improvement, but SAENZ (p. 521) remarks that further experience is needed to determine the full value of the drug.

Monographs on a number of drugs of vegetal origin which may have some effect in leprosy have been written by DE WILDEMAN and PYNAERT (p. 1049).

COCHRANE (p. 1129) discusses recent advances in leprosy work, especially in relation to treatment and segregation, making the point that greater freedom can now be allowed in permitting infective persons to be treated as out-patients provided that precautions are taken to prevent close contact with children.

Rat leprosy

HANKS (p. 969) writes of the infectiousness of murine leprosy bacilli after exposure to various conditions *in vitro*.

HADLER (p. 412) reports a histological study of rat leprosy during treatment with sulphones.

From a comparative study of the pathology of human and murine leprosy, TANIMURA and NISHIMURA (p. 969) conclude that the differences between the murine and human leprosy bacilli are greater than those between human and bovine tubercle bacilli.

MAURI *et al.* (p. 412) report on the action of DDS in rat leprosy; it does not at first prevent the formation of lesions but it slows the development of the disease and later produces involution of the lesions.

Charles Wilcocks

MALARIA

COVELL, Gordon [C.I.E., M.D.], RUSSELL, Paul F. [M.D., M.P.H.] & SWELLENGREBEL, N. H. [D.Sc.]. **Malaria Terminology. Report of a Drafting Committee appointed by the World Health Organization.** *World Health Organization Monograph Series No.* 13. 82 pp. 8 figs. 1953. Geneva: Palais des Nations. [5s.; $1.00; Sw.fr.4.–.] Obtainable from H.M. Stationery Office.

Technical terminology is a necessary part of science; it must describe the objects, methods and processes peculiar to the science, or with which it is specially concerned, and do so in a precise manner which uses words in their proper sense. So far as it is concerned with the definition of objects it can be precise and indeed fails in its objective if it is not. In dealing with methods, processes and abstract subjects it must aim at precision in original definition, but may well leave such matters as the method of measurement to the discretion of individual workers.

The Malaria Commission of the League of Nations fostered a treatise on terminology under the distinguished authorship of CHRISTOPHERS, HACKETT, PAMPANA, SCHÜFFNER and SERGENT (1940, *Bull. Health Org. League of Nations*, v. 9, 131); it included a brief scholarly account of the parasitological terms used in malariology, which removed much confusion. In the consideration of epidemiology and methods of survey the authors clarified the proper use of the terms " rate " and " index ", ignorance of which had produced many anomalies, but beyond this they preferred to report the terms which had been commonly used together with the meanings applied to them, without indicating except by implication their opinion as to which were worthy to be established as technical terms and which were more ephemeral. For this reason their report included, besides much desirable matter, a few meaningless or undesirable terms such as " human blood ratio ", " parasite asymptote ", and " *Anopheles* population constitution ", phrases which would be rejected by most editors.

The World Health Organization has sponsored a revision of this terminology by equally distinguished authors. The general form of the original is followed, some parts being reproduced complete and others re-written or materially amended. The section on parasitological nomenclature is entirely new and all workers will find it useful; it includes the proper names of the many stages of development of the malaria parasites—unknown at the time of the previous report—and is illustrated by diagrams showing 7 types of schizogony. The section on immunity is radically changed; that on the spleen rate is greatly abbreviated to conform with modern practice, and thereby much improved; the nomenclature of anophelines is more briefly treated than before, and the account of terms used in mosquito control has been dropped. The result is a more concise account, the scope of which corresponds well with modern practice.

In the text there have been many detailed changes, some of which can be warmly welcomed while others may be received with doubt. The proposal that the infections should be colloquially known by the un-italicized specific names of the parasites concerned—vivax malaria, etc.—is in accord with common sense and acceptable on grounds of euphony and grammar. The subsequent use of the specific name only as a noun is less happy, as for instance in the sentence: " Granulation very similar to that in vivax is

seen with ovale." This and kindred points are minor but there are major ones which need careful examination before they can be accepted. Common practice in bacteriological nomenclature make it necessary to accept the extension of the original meaning of "immunity" to cover partial degrees of resistance. The term "prophylactic" in describing drugs is here restricted to those which destroy sporozoites or pre-erythrocytic forms, and does not apply to others even though they may cause radical destruction of the parasites before they cause symptoms, as mepacrine has been shown to act by early destruction of erythrocytic forms of *Plasmodium falciparum*. The distinction derives from the Third General Report of the Malaria Commission [this *Bulletin*, 1933, v. 30, 837] on re-reading which it is clear that either criterion could have been selected. In the reviewer's opinion a criterion of total destruction before causing symptoms would have been happier and equally logical. The section dealing with epidemics and outbreaks also deserves analysis. It is advised that the term "epidemic" should be restricted to happenings in places where malaria is usually unknown, or to occasional ones in areas usually of low endemicity, other words being preferable in referring to exacerbations in other circumstances. However, a number of contradictions are obvious in the text. Some happenings in circumstances where the term is excluded are said to be "identical" with those where it is applicable, and the word is actually used in the text in a sense which seems contrary to the recommendation. In the reviewer's experience such restriction of the use of the word creates more difficulties than it solves and it is contrary to normal usage, or we would not speak of epidemics in referring to measles and whooping cough in Britain, or to typhoid or cholera in India.

The work ends with a glossary, partly independent but largely an annotated index to the text. It is comprehensive and well prepared. There has been some pruning of the original edition and this is all to the good, as it now constitutes a handy and useful reference. The reviewer would plead for further pruning on the next edition, restricting definitions to terms which are used only in a technical sense, or which have specifically different meanings in technical and colloquial context, so creating a true vocabulary of this science. *G. Macdonald*

Knyvett, A. F. & Schofield, F. D. **Malaria in Ex-Servicemen.** [Correspondence.] *Brit. Med. J.* 1953, Aug. 8, 339.

The writers of this letter re-emphasize the need for blood examination in ex-servicemen from the Far East who suffer from fever in Britain. A steady stream of cases of *P. vivax* malaria is still being admitted to the Hospital for Tropical Diseases in London. Many are misdiagnosed before admission, and give histories of fever for 2 months or more, so that they are unnecessarily ill with greatly reduced haemoglobin and with enlarged spleens.

If the men have taken suppressive proguanil, as they are ordered, they will give no history of malarial attacks. Many of these patients come from Korea, and in such the latent period is often long: there may be an interval of 6 months or more between the cessation of proguanil and the onset of fever. A positive blood slide will establish the diagnosis, if no antimalarial drug has been given recently, and unnecessary delay in diagnosis will be prevented. *H. J. O'D. Burke-Gaffney*

CRABBE, W. A. **Malaria in Ex-Servicemen.** [Correspondence.] *Brit. Med. J.* 1953, Aug. 22, 444.

The author, writing from Norfolk, refers to the letter of KNYVETT and SCHOFIELD [above] and cites two cases of *P. vivax* malaria in men who had been in Korea 6 and 8 months previously. There was no history of malaria and both had taken proguanil while they were overseas. There was no splenomegaly or other significant sign. In each case, influenza was first suspected and the true nature of the illness was not recognized until blood films were examined, in one case after 24 hours and in the other after 96.

H. J. O'D. Burke-Gaffney

ROBAYNA GALVAN, G. El paludismo en Tenerife. [**Malaria in Teneriffe**] *Rev. Sanidad e Hig. Pública.* Madrid. 1952, May–June, v. 26, Nos. 5/6, 301–16, 1 fig.

The author adduces historical evidence in support of his opinion that malaria was unknown in the Isle of Teneriffe until comparatively modern times: it was certainly free from the disease when first discovered by western navigators. Even now climatic and other conditions are such as to make any severe outbreak of the disease unlikely.

There are two species of *Anopheles* found in the island, *A. sergenti* which breeds near the coast and is never found at altitudes above 200 metres, and *A. hispaniola* which is much more widespread and can be found up to 700 metres above sea-level. Malaria appears to be endemic now, but the small outbreaks that the author describes during the last decade were due to the importation of strains of infection from Spain, by soldiers or seasonal agricultural workers. DDT can be of only limited value in the control of the disease; the anopheline vectors do not frequent dwellings. Reliance is placed on *Gambusia* and oily larvicides. Anopheline breeding places are limited in extent and it should not be impossible to exterminate them. There is always the possibility of the introduction of the dreaded *A. gambiae* from Africa, by ship or aeroplane, and constant vigilance is required.

Norman White

COLLIGNON, E. & JUILLAN, M. Les indices endémiques palustres dans la Station expérimentale du Marais des Ouled Mendil en 1952. [**Indices of Endemic Malaria in the Ouled Marshes Experimental Station in 1952**] [*Arch. Inst. Pasteur d'Algérie.* 1953, June, v. 31, No. 2, 106–9, 1 plan.

This brief report shows on a plan the different territorial and tribal subdivisions of the area and, in a table, the spleen rates in children under 15 years for the various zones, in spring and in autumn. There is a short description of the different population groups and it is shown that Sidi Aïd, to the south-west of the Station, is the most important. Despite an unusually heavy rainy season, malaria did not occur and it is evident that the drainage and other measures already carried out were effective. As in previous years [this *Bulletin*, 1952, v. 49, 220, 476] the spleen indices were lower in the autumn than in the spring. The figures varied in the different zones from 3 to 4 per cent. in spring, but in the autumn only

7 large spleens (3 per cent.) were found in 208 children, all of them in Sidi Aïd. *H. J. O'D. Burke-Gaffney*

East Africa High Commission. **East African Malaria Unit Annual Report 1952** [Wilson, D. Bagster, Director]. 9 pp. 1953. Nairobi: High Commission Printer.

The routine work of training, supervision of executive work, and survey continues in the newly established centre at Amani, Tanganyika. The account is illustrated by a table of spleen and parasite rates, and by an entomological section prepared by Gillies. In this he continues the story of researches on *A. gambiae* and *A. funestus* started in the last report [this *Bulletin*, 1952, v. 49, 913]. The observations concern resting habits, the time of maturation of eggs, the age composition of anopheline populations, and variations in density and sporozoite rates which correspond to each other [*ibid.*, 1953, v. 50, 901]. Stimulating preliminary data on the other subjects studied are presented.

[The form of entomological approach is original, quite new in East Africa, and potentially valuable. The full publication of methods and results should be very interesting.]

Malaria survey work was carried out in Tanganyika and Kenya, and a visit was made to British Somaliland in the later stages of a most severe epidemic of malaria, which involved thousands of deaths. Spleen and blood examinations gave rates of up to 50 per cent. in areas which usually show rates of under 10 per cent. Air-spraying of DDT solution near Dar es Salaam appeared to check the seasonal rise in anopheline density, but many problems, for instance the optimal interval between sprayings, dosage and the type of spray, remain to be solved. *G. Macdonald*

Rao, V. V. **Does Malaria Control Increase Population Pressure?** *Bull. Nat. Soc. India for Malaria & Other Mosquito-Borne Dis.* 1953, Mar., v. 1, No. 2, 81–6. [10 refs.]

This subject is a controversial one and the author reviews some of the literature, referring in particular to the work of Christophers [this *Bulletin*, 1925, v. 22, 396; 1926, v. 23, 524; *Malariology*, W. B. Saunders, Philadelphia and London, p. 699] and others in India, and Bagster Wilson, Garnham and Swellengrebel [this *Bulletin*, 1950, v. 47, 677]. In India hyperendemic malaria with a lower degree of transmission is a feature of the Bengal and Orissa plains where a high birth rate prevails. Settled government and absence of internal anarchy and misrule caused an increase in population over a period of 110 years of 311 per cent. in spite of recorded increases in malaria incidence. In Bengal, without malaria control, the density of population exceeds 600 per square mile. Is malaria a menace in those areas? The inhabitants are very poor physical types and it is in this respect that malaria control is important. The raising of physical standards means a healthier and more vigorous life.

In contrast, it had been said of British Guiana before the introduction of malaria control by residual insecticides that high birth rates were associated with malaria remissions and low birth rates with severe endemic conditions. In Guiana the principal vector anopheline on the coastal zone breeds

throughout the year with some diminution of intensity in the dry season, whereas in Bengal the local vectors have a short seasonal prevalence and transmission is restricted to about 4 months. [The difference in local climatic conditions affecting transmission of malaria in British Guiana and the Bengal and Orissa plains in India makes difficult a comparison of the effect of malaria incidence on the fertility of the respective populations. Evidence from Ceylon, Mauritius and Cyprus would be to the point in a paper of this kind.] *R. Ford Tredre*

GILROY, A. B. **Is Malaria Control the Cause of the Rising Birth Rate on Assam Tea Estates?** *Bull. Nat. Soc. India for Malaria & Other Mosquito-Borne Dis.* 1953, May, v. 1, No. 3, 104–9, 1 fig.

The substantial increase in the birth rate on tea estates in Assam has been attributed to the reduction in malaria following an extensive control programme. A comparison of the birth rate per mille on tea estates with that of all India annually from 1943 to 1951 shows little change in the all-India figure but a steady increase on the estates commencing in 1945: for example, in 1943 the figure for estates was 30·3, and for India 26·1, difference 4·2; in 1951 the figures were: estates 43·7, India 26·6, difference 17·1. The resident estate population is about three-quarters of a million; the juvenile spleen rate fell from 22 per cent. in 1947 to 8 per cent. in 1951, and the attack rate per mille of all ages from 181 to 70. This is only moderately severe malaria and in view of earlier investigations in hyper-endemic zones in Ceylon and Indonesia [this *Bulletin*, 1941, v. 38, 410; 1939, v. 36, 129] it was considered that endemic malaria does not exercise any appreciable influence on the birth rate, and an alternative explanation for the rise in the birth rate on tea estates should be sought.

The Assam Maternity Benefit Act applicable to female workers in plantations and factories came into force in 1945 and provided for a payment to a mother at the birth of a child. This cash bonus is a powerful incentive to complete and accurate registration, the machinery for which has existed for many years. Increases in the bonus occurred in 1947 and 1948; these were the years in which the increase in the birth rate was recorded and for 1949, 1950, 1951 the rate remained fairly stationary at 45·9, 43·9, 43·7. These figures compare well with the estimated birth rates for India, believed to be 10 to 12 per mille above the reported rate of 26·6.

R. Ford Tredre

SOUTH PACIFIC COMMISSION, Noumea, New Caledonia. **A Survey of Malaria in the British Solomon Islands Protectorate. A Report on a Survey made from 12th May to 24th June, 1952** [BLACK, R. H.]. *Technical Paper No. 33.* 1952, Nov., 33 mimeographed pp., 8 maps & 4 figs. [15 refs.]

The author and a technical assistant paid a 6-weeks' visit to some of the Solomon islands, recording a general description of each island, its people and their diseases, and collecting data on anophelism, splenomegaly and parasitaemia. His findings are summarized in the table below, in the last coloumn of which is shown the author's classification of endemicity according to the scheme of the WHO Conference on Malaria in Equatorial Africa [this *Bulletin*, 1951, v. 48, 697].

Island	*Spleen rate*	*2–10 years*	*Spleen rate 11 years and over*	*Parasite rate 2–10 years*	*Parasite rate 11 years and over*	*Comment*
Ongtong Java	(a)	89%	69%	11%	Nil	Holoendemic
	(b)	61%	57%	6%	Nil	Hyperendemic
Sikaiana		19%	27%	6%	Nil	Mesoendemic
Mungava	(a)	16%	15%	Nil	Nil	Mesoendemic
	(b)	30%	20%	26%	2·5%	Mesoendemic
Bellona	(a)	7%	4%	4%	Nil	Non-malarious cases imported
Savo	(a)	88%	55%	23%	5%	Hyperendemic and Holoendemic
	(b)	83%	44%	17%	Nil	
	(c)	83%	62%	23%	Nil	
	(d)	100%	60%	Nil	Nil	
Tetere area of Guadalcanal	(a)	96%	76%	19%	2%	Highly endemic
	(b)	90%	64%	38%	8%	
	(c)	2/2	15/23	Nil	Nil	

[Many of these calculations are based on very small numbers, but percentages are used for comparative purposes.]

A. farauti was found in all islands except Bellona. *A. punctulatus* was found in Savo Island, and *A. koliensis* in Guadalcanal. *G. Macdonald*

UNTI, O. Situação atual da malária no Estado de São Paulo. [**Present Malaria Situation in the State of São Paulo**] *Arquivos de Hig. e Saúde Pública.* S. Paulo. 1952, June, v. 17, No. 52, 207–13. English summary.

The existing Malaria Prevention Service of the Public Health and Social Assistance Secretariat of the State of São Paulo was created in 1938 to control malaria in all parts of the state and to carry out surveys and studies on the epidemiology and prevention of the disease. Its present organization is described in some detail.

During the last four years of the period under review DDT as a residual insecticide was used on an extensive scale but it is not yet possible to determine how much of the decrease in malaria prevalence that has occurred can be attributed to the use of that insecticide. Some noteworthy declines in malaria incidence have occurred in places in which no DDT spray has been used. The problem is, moreover, complicated by the five-year cyclical periodicity that characterizes malaria outbreaks in São Paulo. It is significant, however, that malaria incidence in 1950, the first "cyclical year" in which DDT was used, was much below that of 1945 and closely approximated to that of the expected incidence in "non-cyclical" years before DDT was used. There is still much to learn about the habits of *A. darlingi*, an important vector in many parts of São Paulo State. The decline in malaria incidence that has occurred in the past few years justifies the hope that malaria will soon cease to be the important public health scourge that it has been in the past.

The new insecticides are reducing the incidence of other insect-borne diseases, including Chagas's disease.

Synthetic antimalarial drugs have been extensively used with satisfactory results but none of them can be relied on to prevent relapse.

Norman White

DI PRIMIO, R. Situação da malária no Estado do Rio Grande do Sul. [**The Malaria Situation in the State of Rio Grande do Sul**] *Rev. Med. Rio Grande do Sul.* 1952, July–Aug., v. 8, No. 48, 278–86, 6 figs. [19 refs.] English summary.

This report describes the present malaria situation in the State of Rio Grande do Sul, which is the extreme south of Brazil bordering on the Argentine and Uruguay, and contrasts conditions with those prevailing in 1920 when the first observations were made. Endemic malaria is now confined to a small area near the coast in the north-east of the state; small sporadic outbreaks also occur at irregular intervals along the course of the Uruguay River. *Plasmodium vivax* is responsible for most of the malaria in the state, but *P. falciparum* infections also occur. In the north-eastern endemic area the bromelia-breeding *A.* (*Kerteszia*) *cruzii* is responsible for most of the malaria transmission. Bromelias are excessively abundant in this area: some 40 species of *Bromeliaceae* have been found. They do not occur in the River Uruguay valley, where the chief malaria vector is *A. albitarsis*. Ten other species of *Anopheles* have been reported but none of them plays any important part in transmission. The National Service of Malaria, founded in 1941, has to its credit the virtual elimination of endemic malaria in the state by the use of DDT, chloroquine and the destruction of bromelias.

Norman White

DEMARCHI, J. Acquisitions récentes sur les cycles des hématozoaires. Incidence sur le paludisme humain. [**Recent Research on the Cycles of Malaria Parasites; Application to Human Malaria**] *Méd. Trop.* Marseilles. 1953, May–June, v. 13, No. 3, 337–46. [38 refs.]

A general review and discussion.

TISCHLER, W. Malarialage und Mückenbekämpfung in Montenegro. [**The Malaria Situation and Mosquito Control in Montenegro**] *Anz. Schädlingsk.* 1950, v. 23, Pt. 5, 65–9, 8 figs. [Summary taken from *Rev. Applied Entom.* Ser. B. 1953, June, v. 41, Pt. 6, 92–3.]

The malarious districts of Montenegro are in the south-west and comprise an area to the north of Lake Scutari and several smaller ones on the coast, of which that round Bar was the most important. The main vectors are *Anopheles superpictus* Grassi, which breeds in sunny pools formed in summer in the beds of dried-up mountain streams, particularly those covered with algae, and *A. maculipennis* Mg., which is a lowland species and bred in weedy irrigation ditches, ponds, and, near Scutari, in flood water. Both occurred near Bar. Six varieties of *A. maculipennis* were found, of which *typicus*, *messeae* Flni., *subalpinus* Hackett & Lewis, and *labranchiae* Flni., were present in both areas, and *sacharovi* Favr (*elutus* Edw.), which the author treats as a distinct species, and *fallax* Roub., which he considers to be probably identical with var. *atroparvus* van Thiel, were taken in Bar. The other Anophelines observed were *A. claviger* (Mg.) (*bifurcatus*, auct.), *A. algeriensis* Theo., *A. hyrcanus* (Pall.) and *A. plumbeus* Steph.

Observations in 1944, when the spring was cool, showed that the first eggs of *A. maculipennis* were laid early in May, somewhat later than in normal years, and the new adults began to emerge towards the end of the month. Their numbers reached a maximum in late June and early July. *A. superpictus* began to oviposit about a fortnight later than *A. maculipennis*, and the new adults appeared soon after mid-June. They were most numerous from the end of July to September. Data for 1939–40 are given showing that malaria in children was most severe in Bar in August and September. Control measures undertaken in that district comprised clearing stream beds to avoid the formation of pools, dredging river mouths to allow the salt water to penetrate inland, clearing irrigation canals and improving drainage, filling in small ponds, and fitting taps to piped springs. In addition, breeding places were effectively treated with calcium arsenite mixed with road dust (1:50) and applied each week. The numbers of *A. superpictus* found in a house near a river at Bar, where extensive dusting was carried out, fell from 40 on 16th June to none from 17th July onwards, although it was abundant in districts where little or no control had been carried out. The larvivorous fish, *Gambusia patruelis*, also gave very successful control in water that was not rich in vegetation, and steps were taken to increase its numbers and distribution. As a result of the work, malaria became rare in Bar.

VINOGRADSKAYA, O. N. [**The Spiracles of *Anopheles* and their Variations depending on the Xerophily and Hygrophily of the Individual Species**] *Ent. Obozr.* Moscow. 1950, v. 31, Nos. 1/2, 151–4, 2 figs. [In Russian.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1953, June, v. 41, Pt. 6, 84.]

To supplement a previous paper, figures are given of the abdominal spiracles of *Anopheles superpictus* Grassi, *A. pulcherrimus* Theo., *A. maculipennis* Mg. vars. *sacharovi* Favr and *messeae* Flni., *A. lindesayi* Giles, *A. hyrcanus* (Pall.), *A. marteri* Sen. & Prun. var. *sogdianus* Keshish'yan, *A. algeriensis* Theo., *A. claviger* (Mg.) (*bifurcatus*, auct.), *A. plumbeus* Steph., *Aëdes caspius* (Pall.) and *A. cinereus* Mg., and the pro- and metathoracic spiracles of *Anopheles maculipennis* var. *messeae* are described. It is concluded that the simple and apparently ineffective way in which the thoracic spiracles of *A. maculipennis* close is one cause of the ready loss of water that is characteristic of this and some other species of *Anopheles*. The abdominal spiracles of *Anopheles* possess a more perfect closing apparatus with a well-developed valve. In the hygrophilous species of *Anopheles* and *Aëdes* the openings of the abdominal spiracles are relatively larger and the post-spiracular chamber is cylindrical, whereas in the xerophilous species the openings are smaller and the post-spiracular chamber is conical. The size and shape of the abdominal spiracles and the relative size of the thoracic spiracles are adaptations to existence under different climatic or micro-climatic conditions.

BRISCOE, M. S. **The Relation of Insects and Insect-Borne Diseases to the Vegetation and Environment in Liberia.** Reprinted from *Ecology*. 1952, Apr., v. 33, No. 2, 187–214, 1 fig. [53 refs.]

This paper is based on the author's collections and observations in Liberia during military service from 1943 to 1945. The annual rainfall near the

coast is about 145 in. with a principal wet season from May to October. Mean monthly temperatures were between 76°F. and 82°F., with night temperatures as low as 55°F. An account of the topography, related to geological features, precedes a description of the principal types of soil and of several types of vegetational associations, *viz.*: vegetation on the coastal sands, mangrove, savannah, tropical rain forest, gallery (fringing) forest, a localized association of *Pandanus* and *Raphia* along river courses and in wet forest, and cultivated land.

The distribution of about 190 species of insect in different associations is given in a table. The list includes 5 species of anophelines, 22 culicines, 8 tabanids, 3 species of *Glossina*, besides numerous muscids and other dipterous insects, beetles, hymenoptera, cockroaches and the like. *Anopheles gambiae* was the most abundant anopheline in houses, accompanied by much smaller numbers of *A. funestus* and *A. hancocki*. *A. gambiae* is stated to be the principal vector of malaria and the "ideal" vector of *W. bancrofti*. *A. funestus* is recorded as a secondary vector of malaria. *P. falciparum* was found in 98·8 per cent. of infected Africans, and *P. vivax* and *P. malariae* occurred in 1 per cent. and 0·2 per cent. respectively.

Other common mosquitoes of the coastal savannah were *Aëdes aegypti*, *Culex nebulosus*, *C. moucheti* and *Taeniorhynchus* (*Mansonioides*) *africanus*. Neither *Culex fatigans* nor *C. pipiens* is listed. The breeding places of 25 species of mosquito are shown in a table of 12 larval biotypes. [Although the text refers to *Mansonioides* larvae occurring on *Pistia stratiotes* the table not only records them from permanent pools and swamps but also from tree-stumps. There is no further comment on this in the paper.] *Glossina palpalis* is stated to be the vector of human trypanosomiasis, which is of epidemic importance only along the border to the west.

The paper casts a wide biological net and derives general statements of the associations of the physical and biological features which make the country what it is. [It is doubtful, however, if those particularly interested in mosquitoes or tsetse-fly would find much that is really new about their ecology and habits and the diseases they transmit.] *D. S. Bertram*

See also p. 1085, Hadaway & Barlow, **Studies on Aqueous Suspensions of Insecticides. Part IV. The Behaviour of Mosquitoes in Contact with Insecticidal Deposits.**

Frizzi, G. **Extension of the Salivary Chromosome Method to** *Anopheles claviger, quadrimaculatus* **and** *aquasalis*. [Correspondence.] *Nature*. 1953, June 13, v. 171, 1072, 1 fig.

The examination of salivary gland chromosomes has proved useful in the analysis of the *maculipennis* group of anopheline mosquitoes. The larvae of *A. m. typicus* and *A. m. messeae*, for instance, occurring in the same breeding place cannot be distinguished on morphological characters, yet the X chromosomes are different and may be used to distinguish the species.

In the mitotic cell of *A. quadrimaculatus* from the eastern United States there are 2 mediocentric and 1 acrocentric dot-like chromosomes, somewhat similar to the chromosomes of the somatic cells of *A. claviger*.

An examination of the salivary gland chromosomes of *A. quadrimaculatus* appears promising. Although the chromosomes of the mitotic or meiotic

cells of this species resemble those of *A. claviger* more closely than those of *maculipennis* preliminary results with salivary gland chromosomes support the theory that the American *A. quadrimaculatus* is a member of the *maculipennis* group. The X chromosome in the salivary gland cells is almost the same in the two species.

There is no adequate proof of a phylogenetic relationship between nearctic and palearctic forms of *maculipennis*, but this method of salivary gland examination is a most promising one. The salivary gland chromosomes should also prove useful in separating the *freeborni*, *aztecus* and *occidentalis* forms of the American *maculipennis* group, and also the species of the subgenous *Nyssorhynchus*. *C. Mary Harrison*

See also p. 1085, Jones, **Microanatomical Study of DDT-Moribund *Anopheles quadrimaculatus* Say.**

Madden, J. F. & Macauley, W. L. **Leucopenia occurring during Induced Malaria.** *Arch. Dermat. & Syph.* 1953, June, v. 67, No. 6, 630–32.

"A case of induced malaria is presented in which leucopenia of 1,450 cells per cubic millimeter was observed. It is pointed out that leucopenia, usually less severe than in the case presented, developing during the course of induced malaria is a well described yet unfamiliar phenomenon."

Combe, P. & Raffi, A. Le paludisme aigu du jeune enfant. Données étiologiques et cliniques. [**Acute Malaria in the Young Child: Aetiological and Clinical Data**] *Algérie Méd.* 1952, June–July, v. 56, No. 6, 321–34.

The authors here review the clinical manifestations of acute malaria in children under the age of 3 years. They emphasize that there is an acute phase of preliminary invasion and early relapses usually amenable to early treatment; and a chronic phase found in hyperendemic areas where frequent reinfection has occurred and the clinical state is the result of a balance between developing immunity and repeated reinfection. Aetiological factors are then reviewed, followed by details of the clinical appearances of primary attacks and the special forms in which malaria may present. In making a diagnosis of malaria the first necessity is to think of the possibility, and the second is to search the blood assiduously for parasites. *S. Bell*

Combe, P. & Raffi, A. Traitement du paludisme aigu de jeune enfant. [**The Treatment of Acute Malaria in the Young Child**] *Algérie Méd.* 1952, June–July, v. 56, No. 6, 335–44.

The authors set themselves the task of summarizing recent work on the life-cycle of the malaria parasite, and of reviewing the various therapeutic agents, their mode of administration, dosages in children, and their particular place in treatment. Quinine, still favoured, mepacrine, chloroquine, camoquin, proguanil, and the 8-amino-quinoline drugs are considered in turn. The most suitable doses and the treatment of severe forms of malaria with these drugs are listed, and finally a note is given of prophylactic drug treatment, recommending chloroquine or proguanil. *S. Bell*

TAYLOR, R. Y. **Experiences with Pyrimethamine in Kenya.** [Correspondence.] *Brit. Med. J.* 1953, Aug. 1, 285.

An account is given of 7 cases in Kenya in which it is alleged that pyrimethamine failed to protect against malarial attacks [details of dosage are not given fully]. Three of the patients were children under 3 years of age (one of them, who was gravely ill, being the writer's own child), in all of whom convulsions were the earliest feature. In only one of the cases, however, were parasites found in a blood slide. Two other children suffering from diarrhoea and vomiting had positive blood slides. Two adults whose blood slides were negative had " severe attacks ". There were thus 7 cases in all, in 3 of which parasites were found. [No information is given as to whether proguanil has been extensively used in this area, which might have resulted in the appearance of a strain of parasite possessing some degree of cross-resistance to the two drugs.]

The writer of the letter also reports the death of a child aged 20 months after swallowing about 15 tablets of pyrimethamine. Two other children in the locality are said to have consumed about the same number of pyrimethamine tablets (in neither case with serious ill-effects), and stress is laid on the necessity of keeping the drug under lock and key in view of its relatively attractive taste.

Colonel Taylor suggests that when research is carried out on a new antimalarial drug, tests should be made not only on non-immune subjects in Europe and on the indigenous inhabitants of malarious areas, but also on Europeans living under normal conditions of life in the tropics.

[In the abstracter's opinion the practical difficulties in staging an adequately controlled experiment under such conditions are insuperable; but valuable information might be obtained from an analysis of the records of those practitioners in malarious areas who keep accurate records of all cases coming under their immediate notice.] *G. Covell*

NICOL, B. M. **Use and Effectiveness of Antimalarial Drugs. Experience of Non-Native Resident Population of Nigeria, West Africa.** *Brit. Med. J.* 1953, July 25, 177–80. [12 refs.]

An investigation was carried out in Lagos, Nigeria, with the object of discovering which antimalarial drugs are being used in the prophylaxis of malaria by non-African residents in that area, and what was the incidence of malaria in each group. The subjects interrogated, 531 in number, comprised all the non-Africans who attended the author's out-patient clinic between 1st November, 1951, and 31st March, 1952, irrespective of the complaint which brought them to hospital.

At the time the patients were interviewed proguanil was being used (in round figures) by 68 per cent.; quinine by 16 per cent.; mepacrine by 6 per cent.; and chloroquine by 2 per cent. Of the whole group, 8 per cent. admitted to being, or were known to be, intermittent in their habits. Only one individual did not take any antimalarial drug.

Among the adults who had taken only one antimalarial drug daily with regularity since starting to live in Nigeria, a past history of malaria was reported as follows: those taking 100 mgm. of proguanil, 15 per cent.; 200 mgm. of proguanil, 0 per cent.; 100 mgm. of mepacrine, 17 per cent.; 4 or 5 grains of quinine, 50 per cent. Chloroquine in doses of 300 mgm. twice or thrice weekly had been taken regularly by 3 individuals, none of whom reported having had malaria.

The evidence available indicated that malaria attacks occurred in about 10 per cent. of those using a daily dose of 100 mgm. of proguanil, but that

daily doses of 200 mgm. of proguanil, or doses of 300 mgm. of chloroquine twice or thrice weekly, provided efficient protection against the local strains of *P. falciparum*. No ill-effects were noted in those taking 200 mgm. of proguanil daily.

The author concludes that proguanil taken in doses of 200 mgm. per day by those 10 years of age and over, and 50 mgm. by babies under 1 year, is the most satisfactory prophylactic available for protection against Nigerian strains of *P. falciparum* at the present time. *G. Covell*

LIVIDAS, G. A. & GEORGOPOULOS, G. **Development of Resistance to DDT by *Anopheles sacharovi* in Greece.** *Bull. World Health Organization.* Geneva. 1953, v. 8, No. 4, 497–511, 5 figs. [12 refs.]

House-spraying with DDT between 1945 and 1950 proved to be a highly effective method of controlling the malaria vectors *Anopheles sacharovi* and *Anopheles superpictus* in Greece. In the second year of spraying house-flies appeared in large numbers and in the following years the same phenomenon was noticed with other domestic pests. There was no sign of DDT becoming ineffective against anopheline mosquitoes, however, until 1951.

In 1952, DDT was still giving an adequate control of *A. sacharovi* in the Mórnos district of the Navpaktos region, but this was no longer true for the same species of mosquito in certain areas of the Peloponnese.

Malaria was prevalent in the Skála district of the Lakonia region before the advent of DDT, but by 1946 the parasite rates of infants and school-children in this area had dropped to zero. House-spraying was stopped in this area in 1951, but was resumed again owing to the rapid reappearance of anophelines in the middle of the season. The anopheline density continued to be unusually high and consequently careful observations were made in the two villages of Asterion and Souli.

Between 2nd and 4th July all buildings, apart from two stables, in Asterion were sprayed with a DDT emulsion at the rate of 2·0 gm. of active ingredient per square metre. There was a reduction in the numbers of *A. sacharovi* immediately after spraying, but after one month the numbers of anophelines were similar to those in the unsprayed stables. Many specimens found in houses after spraying were dead, or showed definite toxic symptoms, but approximately 20–30 per cent. rested on sprayed surfaces apparently unaffected.

A number of *A. sacharovi* caught in sprayed houses in Asterion were placed in clean cages and after 72 hours some were transferred for 30 minutes to a box sprayed with a DDT emulsion to give a deposit of 2 gm. of active ingredient per square metre, while others were transferred to a similar untreated box as a control. The results of this experiment are summarized in the following table:

TREATMENT	NO. OF MOSQUITOES	PERCENTAGE SURVIVORS after 24 hrs.	48 hrs.	72 hrs.
DDT 2 gm. /sq. metre	1,194	28·4	21·4	18·3
UNTREATED	808	81·6	64·0	54·3

A similar experiment with *A. sacharovi* adults bred in the laboratory from larvae collected from breeding places in the Skála district gave the following result:

Treatment	No. of Mosquitoes	Percentage Survivors 24 hrs.	48 hrs.	72 hrs.
DDT 2 gm. /sq. metre	231	52·4	41·1	32·0
Untreated	199	92·0	75·4	68·3

The village of Souli was sprayed annually from 1946 but was not sprayed in 1952. In June, 1952, *A. sacharovi* adults caught in houses were exposed for 30 minutes to boxes treated with the following insecticides:—DDT in kerosene giving a deposit of 2 gm. of DDT/sq. metre; DDT emulsion giving a deposit of 2 gm. of DDT/sq. metre; Gammexane L.G. 140 giving a deposit of 150 mgm. of active ingredient/sq. metre; chlordane giving a deposit of 150 mgm./sq. metre; and dieldrin at 200 mgm./sq. metre.

Chlordane and dieldrin gave 100 per cent. kill of *A. sacharovi* within 24 hours during the first ten days after treatment of the boxes. There were few survivors from the box treated with DDT in kerosene in the first few days after treatment, but after one month the number of survivors from a 30-minute exposure was nearly 50 per cent. A considerable number of mosquitoes placed in the box treated with DDT emulsion within the first 10 days of treatment survived. The survival of *A. sacharovi* placed in the box treated with gammexane was 10 per cent. within the first 10 days rising to 89·7 per cent. after one month. The authors state that there is no doubt that the local malaria vector has developed a considerable degree of resistance to DDT and also to gammexane although this insecticide has never been used in the area. [The results would have been more convincing had a strain of *A. sacharovi*, known to be non-resistant, been used for comparison in the laboratory tests.] *C. Mary Harrison*

Jerusalem: Ministry of Health. **Report of the Antimalaria Department for 1950–1952** [Saliternik, Z., Director]. 68 mimeographed pp., 9 diagrams & 1 map. 1953, Apr. [In Hebrew.] English summary.

Malaria is still a danger in Israel, potential as well as actual. As a practical proposition its eradication is fraught with difficulties despite an efficient malaria organization and the use of all the modern techniques. Movements of people within the territory and across its lengthy land frontier from malarious places maintain a reservoir of infection. Many new immigrants with low living standards settle all over the country in inferior dwellings without taking any protective measures. The development and exploitation of water resources enable 13 species of anopheline mosquitoes to thrive in the sub-tropical climate and has, in particular, tended to increase the numbers and areas of distribution of *Anopheles sergenti*.

Climatic conditions can be very variable and materially affect the density of production of the vector anophelines, *e.g.*, unusual rains early in the mosquito season; a generally dry season; the lethal effect of the dry *khamseen* winds. The breeding of *A. sacharovi*, a domestic species, is

seriously affected to the point of elimination by residual DDT spraying of houses, and a decrease in the area of the Huleh swamp water plus DDT spraying was followed by great reduction in numbers of *A. sacharovi*. *A. sergenti*, being semi-domestic, is not affected in the same measure; it prefers man-made waters for breeding; adults rest outdoors and bite inside dwellings as well as in the open. It is now the main vector of malaria and is particularly dangerous after *khamseen* nights in the autumn in the Jordan valley, where large swarms invade settlements. *A. superpictus*, the rocky-stream breeder, has been greatly reduced and the salt-water breeder, *A. multicolor*, is becoming rarer because of the lowering of soil salinity by extended irrigation.

A great decrease in incidence of malaria has occurred in recent years in the Central and Southern Districts of Israel, but in the north—the Jordan and Beisan Valleys and Upper Galilee—in 1952 there was a marked rise despite systematic DDT sprayings. The marked reduction in numbers of *A. sacharovi* and the extension of breeding places of *A. sergenti* in artificial swamps have altered the pre-DDT curve of yearly malaria incidence; the early *sacharovi* peak of incidence has gone but the autumnal *sergenti* peak in October continues to be well-marked with perhaps a more rapid decline by December. During the three-year period 1950–52 the proportion of *vivax*:*falciparum* cases has changed from 3:1 to 2:1, a relative increase in *falciparum* infection.

Control measures comprise technical and chemical work in the swamp areas and residual DDT sprayings in dwelling places. The efficiency of the residual insecticide technique is marred by: (a) objections by householders who see no value in the continuation of the technique because house-flies, bugs, etc., are not so readily affected as previously; (b) variable types of temporary dwellings in immigrant camps; (c) sleeping outdoors in the *sergenti* season; (d) in the presence of DDT anopheline mosquitoes have adapted themselves to outdoor or other resting places inaccessible to DDT application. In consequence, in those areas where the semi-domestic vectors, *A. sergenti* and *A. superpictus*, are prevalent it is necessary to combine large-scale field work in the swamp areas with DDT spraying in houses.

The survey and control of schistosomiasis is also a function of the Anti-malaria Department. Snails are not found in the areas of high soil-salinity or mountain streams. The great potential menace of mass infection, which has increased considerably with the immigration of parasite carriers from Yemen, Iraq, Egypt and Persia, can be overcome. *Bulinus* snails have been eradicated from wadis by copper sulphate; *Planorbis* snails are not as rare as expected. No new cases of infection were notified in 1952.

R. Ford Tredre

Gramiccia, G., Garrett Jones, C. & El Din Sultan, G. Spruzzatura a striscie: un metodo più economico di lotta anti-malarica con insetticidi a potere residuo. [**Spraying in Strips, an Economical Method of Malaria Control with Residual Insecticides**] *Riv. di Parassit.* Rome. 1953, Apr., v. 14, No. 2, 123/32, 3 figs. English summary.

The authors had considered various ways of reducing the cost of insecticide used in a residual-spray antimalarial campaign. The dose applied could be reduced, the interval between treatments increased or economy achieved by reducing the area sprayed. The last mentioned alternative was adopted because it achieved a substantial economy without reducing the length of residual effect. As regards the mosquitoes' chances of escaping

contact with the residue, it was calculated that if one alighted 3 times on a treated wall (during the incubation period of *Plasmodium*) it had a 94 per cent. chance of encountering insecticide.

The efficiency of restricted spraying was put to test in a large field trial in Syria and the Lebanon. The method was to spray houses in strips 30 cm. wide, separated by untreated bands of the same width. This was done from the ceiling down to a height of 1 m. from the floor, below which the local mosquitoes rarely rested. The spray treatment was a 75 per cent. DDT wettable powder, suspended in water and applied at the rate of 2 gm. DDT per sq. m.

Various malarious districts were selected for the trial, as shown on a map, and other districts were protected by the normal complete house-spraying method. Both areas had adjacent untreated control zones. The anopheline mosquitoes present in the 2 areas were similar, *viz.*: *A. sacharovi*, *A. superpictus*, *A. claviger*, *A. hyrcanus*, etc., of which the first 2 were the most important. The 2 areas experienced very similar weather during the trial, but certain local circumstances varied in different localities and this somewhat interfered with the comparative value of the trial. (1) In the area treated with normal spraying, a great deal of cotton was grown and this was heavily dusted during the growing season. The widespread use of insecticides had a definite suppressing effect on the local mosquitoes [*cf.* this *Bulletin*, 1953, v. 50, 1014]. In the area treated with strip spraying, cotton was mainly replaced by cereals. (2) In the normally sprayed zone, much of the housing was of a poor type without chimneys, so that the residual deposits tended to be covered by soot from indoor fires. In the better houses of the strip-sprayed zone, this did not occur to the same extent.

The spraying was done in March–April, 1952, and the results were judged by malariological data and mosquito counts before and after treatment. Spleen indices of children were as follows:

	Autumn 1951	Summer 1952	Autumn 1952
Normally sprayed zone ...	42	20	16
Control	67	37	23
Strip-sprayed zone	16	6	3
Control	23	23	16

Parasite rates of the same children were:—

	Winter 1951–2	Winter 1952–3
Normally sprayed zone	5·3%	0·9%
Control	8·2%	1·3%
Strip-sprayed zone	1·1%	0·2%
Control	2·9%	0·6%

(*P. falciparum* constituted 36 to 57 per cent. of the infections in 1951–52.)

The all-round decline in malaria does not permit any conclusion on the relative values of the spray treatments.

Mosquito counts were made in treated houses, in untreated houses in the sprayed zones and in houses in the control zones. In the zone sprayed in strips, the houses were kept free from mosquitoes up to and including spring, 1953; whereas a few appeared in the totally sprayed houses in autumn and winter, 1952. The latter failure may have been due to the soot deposit already mentioned. Some mosquitoes appeared in unsprayed houses in both sprayed zones throughout, but the disparity of counts before treatment does not permit further conclusions to be drawn.

The authors give a budget for the scheme from which it appears that an economy of 30 per cent. is made by the strip-spray method. They state that they believe this method to be as effective as normal spraying [but in view of the inconclusive data quoted, this does not seem to have been proved]. *J. R. Busvine*

DAVIDSON, G. **Experiments on the Effect of Residual Insecticides in Houses against** *Anopheles gambiae* **and** *A. funestus*. *Bull. Entom. Res.* 1953, July, v. 44, Pt. 2, 231–54, 4 figs. on pl. and 2 graphs.

This paper gives fuller details of the field trials at Taveta, Kenya, described by the author in earlier reports [this *Bulletin*, 1952, v. 49, 117; 1953, v. 50, 190, 191]. Three series of experiments were conducted between February, 1950, and August, 1951. The technique was somewhat improved in the last series, in particular in the construction of the "trap huts" used to test the residual powers of the insecticides.

Observations on 4 huts, described in the first paper, were continued up to a period of 9 months. It was found that BHC applied at approximately 150 mgm. per sq. ft. (20 mgm. *gamma*) continued to have some effect up to 7 months after application. The irritant properties of the DDT applications (100–300 mgm. per sq. ft.) continued up to the end of the 9 months.

In the second series of tests it was found that doses of less than 80 mgm. DDT and less than 60 mgm. BHC (8 mgm. *gamma*) per sq. ft. gave kills of over 50 per cent. of *A. gambiae* and *A. funestus* for only one month.

The third series of experiments has been briefly described in the last 2 publications mentioned. Ten huts were used, treated as follows: (i) DDT oil-bound suspension, 187 mgm. to the roof only (all doses are per sq. ft.); (ii) DDT wettable powder, 229 mgm.; (iii) DDT paste, 238 mgm.; (iv) DDT (30–70μ crystals), 51 mgm.; (v) DDT (0–30μ crystals), 124 mgm.; (vi) Dieldrin, 50 mgm. calculated; 7·2 mgm. according to a chemical test; (vii) BHC, 7 mgm. *gamma* plus DDT, 223 mgm.; (viii) BHC wettable powder, 21 mgm. *gamma*; (ix) BHC oil-bound suspension, 18 mgm. *gamma*; (x) control, untreated.

An overall picture of the relative efficiency of the different insecticides can be gained from the following table, which gives the average monthly mosquito mortality figures from huts treated as follows: BHC (viii) and (ix); DDT (ii), (iii), (iv) and (v); dieldrin (vi).

Months after treatment	Percentage mortalities								
	BHC			DDT			Dieldrin		
	*g	*f*	*fat.*	*g*	*f*	*fat.*	*g*	*f*	*fat.*
1	100	100	85	57	69	16	100	100	95
2	91	92	33	66	71	10	100	100	87
3	71	76	26	72	76	17	99	100	77
4	52	40	14	53	65	24	89	96	57
5	48	33	14	63	65	34	88	95	69
6	66	29	7	55	62	20	93	88	58
7	—	—	—	36	51	—	93	81	69

* *g* = *A. gambiae*; *f* = *A. funestus*; *fat.* = *C. fatigans*.

The control mortalities observed among the 3 species of mosquitoes were *Anopheles gambiae*, 5 to 20 per cent.; *A. funestus*, 9 to 23 per cent.; *Culex fatigans*, 1 to 10 per cent. The kills of the 2 anophelines were fairly similar and both were considerably more susceptible than *C. fatigans*. All 3 insects,

however, gave the same indications regarding the insecticides. The BHC gave high kills for 1 to 3 months and then declined in efficiency. The DDT gave only moderate kills but no evidence of a decline for at least 6 months. The dieldrin showed high and prolonged effectiveness.

In considering the relative effectiveness of different formulations and combinations of the DDT and BHC, the following may be said: (a) DDT applied to the roof only (i) was definitely less effective than a complete spraying. (b) There was no clear difference between oil-bound suspensions (ix), (iii) and wettable powders, (viii), (ii). (c) The specially prepared fine DDT crystals (v) were more effective than the coarser crystals (iv) at first, but the latter improved after a few months. (d) The combinations of DDT and BHC (vii) to some extent combined the advantages of both, but did not equal the performance of the dieldrin.

[It is unfortunate that there is some doubt about the exact dosage of dieldrin applied.] *J. R. Busvine*

CHOWDHURY, S. R. **Malaria Control in Coalfields in India.** *Bull. Nat. Soc. India for Malaria & Other Mosquito-Borne Dis.* 1953, May, v. 1, No. 3, 95–103, 1 map & 1 folding chart.

A coordinated and comprehensive scheme for malaria control was introduced in 1945 in the major coalfields of India, which contribute 95 per cent. of coal output of that country. The population protected approximates to 850,000. The coalfields are widely separated geographically. Spleen rates in 1945 varied between 10 and 38 per cent.; *Plasmodium vivax* and *P. falciparum* are the infecting parasites; *Anopheles minimus* or *A. culicifacies* are the principal vectors. Man-made breeding places are a problem. Miners are a migrant group, their work is strenuous and is done in unhygienic surroundings. In 1947 residual insecticides replaced anti-larval measures as the main feature of malaria control; spraying is carried out on 3 occasions each malaria season with 6 to 8 weeks intervals. From July to October organized groups of imported labour are given suppressive proguanil in a dose of 0·3 gm. per week. In 1951 spleen rates had fallen to between 2·3 and 6·3 per cent. and malaria incidence reduced by 78 per cent. to an average annual rate per 1,000 of 66·5. *R. Ford Tredre*

RAFI, S. M. **Rural Malaria in the Punjab and a Five-Year Scheme to Control it.** *Pakistan J. of Health.* 1953, Apr., v. 3, No. 1, 35–42.

In the Punjab more than 80 per cent. of people live in the countryside and are occupied in agricultural pursuits. The sowing and harvesting seasons for wheat and rice crops coincide with the periods of greatest incidence of malaria. Spleen rates in children may be as high as 80 per cent. and are rarely less than 20 per cent. The most malarious areas are those in which waterlogging is associated with irrigation networks and with seasonal flooding and overflow of rivers and storm-water channels. In certain of such areas deterioration in health is marked and the relationship of numbers of deaths and births indicates a decline in the aggregate population, *e.g.*, in one district with a population of approximately 400,000 the proportion of births to deaths in 1949 was 86 to 100.

In 1951, control by the residual insecticide technique commenced; the routine followed was to spray the interior wall surfaces and ceilings of human and animal dwellings with a suspension of 50 per cent. DDT wettable powder (8 ounces, later doubled, of powder to one gallon of water) at the

rate of one gallon per 1,000 sq. ft. of surface; the apparatus used was the stirrup pump.

The active transmission season for malaria follows the rains and is limited to, at most, three months; fresh infections occur principally in September, October and November. The pre-rain months of May and June are extremely hot and inimical to mosquitoes; the anopheline population is then at its lowest ebb. The best time for spraying operations is, therefore, the months of June and July and they should be completed by August 15th at the latest.

Pre-operational data collected were the spleen and parasite rates of children aged 2–10 years. Post-operational data included: (a) the calculation of the same rates in the month of January; (b) monthly blood examination of infants in their first year of life; (c) incidence of fever cases recorded at fortnightly domiciliary visits; (d) weekly adult mosquito collection at fixed catching stations; (e) weekly quantitative recording of larvae in breeding places. Results are to be published at a later date. The cost per caput per annum is about 8 annas. Experience has shown that legislation is required to prevent householders from rubbing off the deposit of DDT or re-plastering walls after spraying. By 1952 1½ million people had been protected and by 1956 it is expected that the figure will be increased to 6½ million.

R. Ford Tredre

SRIVASTAVA, R. S. **Malaria Organisation, U.P.** *Bull. Nat. Soc. India for Malaria & Other Mosquito-Borne Dis.* 1953, Mar., v. 1, No. 2, 70–80.

This paper is a description of the work of the Provincial Malaria Organization of Uttar Pradesh, India. The older methods of malaria control directed against the aquatic stages of the mosquito are still found to be necessary in concentrated urban areas, but spray killing of adult mosquitoes with insecticides is used in scattered rural populations. Antimalarial drugs, notably proguanil, are used when necessary to support anti-mosquito measures. A Government quinine tablet manufacturing factory produces various quinine preparations and is responsible also for the sale and distribution of mepacrine and proguanil, the latter being obtainable in 1-anna packets at post offices; some 4 million tablets of the newer drugs are sold annually. The district antimalaria units rely on the use of residual insecticides, but proguanil prophylaxis and adequate treatment of malarious persons are applied when necessary. Spleen rates and incidence of malaria have been much reduced and agricultural activities extended. A scheme for the application of residual insecticides by voluntary labour in many villages in 24 districts has been successfully introduced recently.

R. Ford Tredre

VISWANATHAN, D. K. **Malaria Organisation, Bombay State.** *Bull. Nat. Soc. India for Malaria & Other Mosquito-Borne Dis.* 1953, Mar., v. 1, No. 2, 57–69.

This organization, created in 1942, has attained great success in the control of malaria through the acumen of its Director in accumulating data by malaria surveys, then introducing and assessing the value of DDT applied as a residual insecticide in a pilot field experiment and finally extending the method to other parts of the State.

A complete picture of malaria epidemiology in the whole of Bombay State, with 27 districts and a population of 35 million, has been obtained.

Twenty-three million live in malarious tracts and half of these have been protected at a cost of approximately 8 annas per head per annum. Spleen rates have fallen from above 30 per cent. to 7 or less, and attendance for malaria at dispensaries in the protected areas has been reduced by two-thirds. This short paper describes the development of the organization and its adaptation to the needs of various districts. *R. Ford Tredre*

LOVE, G. J. & KARTMAN, L. **Effects on** *Anopheles quadrimaculatus* **of Dusting for Control of Cotton Insects.** *J. Econom. Entom.* 1953, Feb., v. 46, No. 1, 166–7, 1 fig.

In the delta area of Phillips County, Arkansas, a great deal of cotton is grown and heavy dusting is carried out in June against boll weevils. A typical dust contains 3 per cent. BHC, 5 per cent. DDT and 40 per cent. sulphur. Between 1948 and 1951, regular measurements were made of populations of adult and larval *Anopheles quadrimaculatus*, as part of a malaria investigation programme. It was noticed that there was a sudden drop in June at the time of the cotton dusting. The connexion was confirmed by experiments in which caged insects were confined at various distances from a field during application of dust. These tests established that, except in densely wooded areas, cotton dusting killed mosquitoes up to 500 yards from the field. Since probably no point in the rural areas in this region is as much as 500 yards from a cotton field, the effects of the dust treatments on mosquitoes is not surprising. *J. R. Busvine*

DE BUSTAMANTE, F. M. Síntese das atividades do Serviço Nacional de Malária do Brasil no decênio 1942–1951—campanha contra a malária, a doença de Chagas e a filariose. [**Activities of the National Malaria Service of Brazil during the Decade 1942–51—Campaigns against Malaria, Chagas's Disease and Filariasis**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1952, July, v. 4, No. 3, 231–44. English summary.

This is a summarized account of the activities of the National Malaria Service of Brazil from its inception towards the close of 1941 to the end of 1951. Up to the end of 1949 malaria investigations and control were the sole preoccupations of the Service. A further duty was then assigned to it, the control or eradication of the insect vectors of Chagas's Disease. In 1951 the Service was further charged with the study of the distribution of filariasis in the country and where necessary to eradicate, if possible, the vectors with insecticides.

Brazil covers an area of 8½ million square kilometres and has a population of nearly 53,000,000. Malaria was endemic over about 85 per cent. of the country. The vectors are *A. darlingi*, *A. aquasalis*, *A. albitarsis*, and, in a small area in the south of the country, *A.* (*Kerteszia*) *cruzii*, *bellator* and *homunculus*. *A. darlingi* is the most important vector and near the coast displays the domestic characteristics which it does elsewhere. In the valleys of the Amazon and the São Francisco, however, it displays marked zoophilism, and here it may transmit malaria out of doors.

Up to 1945 control measures were directed mainly against the aquatic stages of the vector's life: much drainage and reclamation work was done and there was a vast expenditure of larvicides. In 1945 DDT spraying was begun. In 1950 2,603,023 houses were so treated. With the exception of the scattered inhabitants of remote regions where means of communication are very poor, the great majority of the rural population of the vast country

are now protected with DDT. A watery suspension of DDT is generally used, 1·5 to 2·0 gm. per square metre. The vast majority of houses are sprayed but once a year. The overall results have been excellent: the incidence of malaria has been reduced by upwards of 90 per cent.

During 1951 surveys to determine the distribution of Chagas's disease were carried out. In certain areas in the States of Minas Gerais and São Paulo spraying with BHC has been used to destroy the vector *Triatoma infestans*: 130,084 houses were so treated. *Norman White*

PRIETO LORENZO, A. Estudio parasitológico y experimental del "Plasmodium berghei" Vincke y Lips, 1948. [**Parasitological and Experimental Study of** *P. berghei*] *Med. Colonial.* Madrid. 1953, June 1 & July 1, vols. 21 & 22, Nos. 6 & 1, 621–51; 30–53, 5 figs. [Numerous refs.]

This long summary of the literature on *P. berghei* (most of which has been reviewed in this *Bulletin*) is divided into sections on history, morphology, susceptible rodents and the course of the infection in them, resistance of *P. berghei* to low temperatures, routes of inoculation employed, incubation period, blood changes, pathology of the infected rat, exoerythrocytic phase, immunity and treatment. It forms a useful résumé and guide to the literature but contains nothing new. The three illustrations are poor.

Charles Wilcocks

FULTON, J. D. & RIMINGTON, C. **The Pigment of the Malaria Parasite** *Plasmodium berghei.* *J. General Microbiol.* 1953, Feb., v. 8, No. 1, 157–9, 4 figs. on pl. [10 refs.]

The authors describe the results of a chemical and spectroscopical analysis of the pigment produced by *Plasmodium berghei.* After extraction of the residue of centrifuged red cells recovered from infected rats at the height of parasitaemia, phenol extracts were mixed with ethanol and filtered, and the solution was dialysed against tap and distilled water, until turbidity occurred in the coloured layer. When the latter was mixed with water a fine precipitate was produced, which was collected by centrifugation, washed in distilled water and dried *in vacuo.* Some of the residue was dissolved in NaOH, and pyridine with sodium dithionite were added to the solution, after which the spectrum of pyridine haemochromogen was revealed. When the remainder of the residue was subjected to the Grinstein procedure the resulting crystals proved to be identical with protoporphyrin IX dimethyl ester. It was thus demonstrated that, as in the case of all other malaria parasites so far examined, the pigment of *P. berghei* is also represented by haematin.

The appearance of the pigment in various stages of the parasite is illustrated in a series of photomicrographs. *C. A. Hoare*

JASWANT SINGH, KRISHNASWAMI, A. K., SATYA PRAKASH, RAY, A. P. & RAMAKRISHNAN, S. P. **Studies on** *Plasmodium berghei* **n. sp. Vincke and Lips, 1948. VI. Reaction of Blood-Induced Infection in Albino Mice to Daraprim, 2:4-Diamino Pyramidine.** *Indian J. Malariology.* 1952, June, v. 6, No. 2, 183–8.

This paper describes the action of daraprim [pyrimethamine] in white mice inoculated intraperitoneally with 5 million *Plasmodium berghei* parasites. The drug was started when the density of parasites reached 200 per

10,000 erythrocytes, and was given twice daily for 3 days in varying dosages. Amounts as small as 1×10^{-6} mgm. per 20 gm. weight of the mouse had an effect on the parasitaemia, and 1×10^{-5} mgm. to 0·07 mgm. cleared the blood of parasites for as much as 9 days; 8×10^{-2} mgm. produced radical cure and caused disappearance of the parasites in 48 to 84 hours from the commencement of treatment, gametocytes taking longest to go. The duration of suppression was measured in terms of size of dose of the drug and it was found that the larger the dose the longer was the period of suppression, the effect being due to the prolonged time of elimination. *P. C. C. Garnham*

RAMAKRISHNAN, S. P. **Studies on *Plasmodium berghei* n. sp. Vincke and Lips, 1948. VII. Spleen Size in Albino Mice and Rats with Blood-Induced Infections.** *Indian J. Malariology.* 1952, June, v. 6, No. 2, 189–98. [21 refs.]

The volume of spleens of rats and mice infected with *Plasmodium berghei* was determined in particular reference to the nature of the infection and the effect of small doses of quinine and sulphadiazine. The average volume of the spleen of full-grown white mice was 0·2 cc. and of white rats 0·4 cc. In *P. berghei* infections in mice the spleen could double in size, in rats it could become 5 times or more enlarged, the actual volume largely depending in acute cases upon the interval between inoculation and death: after a week the spleen enlarged 3 times, after a fortnight 4 times, and after 3 weeks 11 times. After the crisis, during latency, the spleen size decreased and was rarely over double the normal volume; 3 months after radical cure it was still above normal size. The effect of drugs was merely to lessen the rate and degree of splenomegaly—an effect which should be kept in mind in malaria surveys of the human population. Mice inoculated with large numbers of parasites showed a lesser degree of splenic enlargement than those inoculated with smaller numbers, and it is pointed out in an interesting discussion on splenic enlargement in other forms of malaria, that it is the more benign infections which cause the greatest degree of splenomegaly, while acute and lethal parasites like *P. falciparum* and *P. knowlesi* have a less marked effect on the organ. *P. C. C. Garnham*

GRIGNASCHI, V. J. Observaciones sobre la biologia del *Plasmodium gallinaceum* Brumpt 1935. [**Biological Observations on *Plasmodium gallinaceum***] *Riv. di Parassit.* Rome. 1952, Oct., v. 13, No. 4, 261–4, 2 figs. English summary (4 lines).

The object of this study was to determine whether the blood transmission of *Plasmodium* was effected by the erythrocytic or exo-erythrocytic parasites of the donor. The blood of a chronically infected adult fowl was inoculated intramuscularly into a 4-day-old chick. When the parasitaemia in the latter reached 60 per cent. of infected red cells (10th day), its blood was inoculated by the same route into 3 1-month-old chicks. Four days later the blood from each of these chicks was inoculated into a batch of 3 fortnight-old chicks, while an emulsion of their brains and muscle (taken from the site of inoculation) was inoculated into another batch of 3 chicks. The batch inoculated with the blood developed an infection, the parasitaemia in 2 chicks reaching 80 per cent., and ultimately killing 1 of them, while in the other the parasitaemia decreased and the infection became chronic. The 3rd chick died of extraneous causes while the infection was still scanty. As regards the batch inoculated with tissue emulsion, they remained

negative and subinoculations of their blood into other chicks failed to produce infection.

It is concluded that transmission of *P. gallinaceum* by inoculation of blood taken during the acute phase of the infection is effected by the erythrocytic forms of the donor which directly invade the red cells of the recipient, without establishing an exo-erythrocytic phase. *C. A. Hoare*

RAMAN, K., RAGHAVAN, M. & GUHA, P. C. **Sulphabiguanide Derivatives.** *J. Indian Inst. Sci.* 1953, July, v. 35, No. 3, 247–50 (Sect. A).

"The synthesis and properties of twenty-four N^1-N^5-substituted biguanides are described in this paper. The compounds have been screened for antimalarial activity against *P. gallinaceum* in chicks. None of the compounds tested showed any activity."

BLACKWATER FEVER

SINGH, I. **Proguanil and Blackwater Fever.** *Brit. Med. J.* 1953, Mar. 14, 598–600. [23 refs.]

Two cases diagnosed as blackwater fever in India are reported in this paper. In the first, *Plasmodium falciparum* rings were demonstrated in the blood, and after the administration of 800 mgm. proguanil the patient had rigors and passed 240 ml. dark urine. In this haemoglobin was demonstrated spectroscopically, and albumin, a trace of sugar, an amorphous deposit and a few hyaline casts were also present. The serum contained oxyhaemoglobin and methaemoglobin; no examination for methaemalbumin was made. Blood collected for serum bilirubin estimation was found to be haemolysed. The patient recovered after treatment including the administration of glucose saline intravenously, alkalis, and 20 ml. of concentrated (anti-snake) antivenin.

The second patient passed black urine before admission to hospital, some 8½ hours after taking 600 mgm. proguanil for a suspected but unconfirmed attack of malaria. While in hospital he passed "about 4 oz. of dark haemoglobinuric urine". No facilities were then available for carrying out special investigations but microscopy showed that he was not suffering from haematuria, and blood examination revealed the presence of *P. vivax* rings. Four days later the serum bilirubin was 0·4 mgm. per 100 ml. and both serum and urine were free from oxyhaemoglobin and methaemoglobin.

There follows a discussion of current theories relating to blackwater fever.

[The abstracter regrets that he is unable to accept the diagnosis of blackwater fever as proven in either of these cases. The essential characteristic of the disease is intravascular haemolysis leading to the presence in the serum of methaemalbumin and of high bilirubin values. No tests for methaemalbumin were carried out in either case, and the serum bilirubin value quoted is within the normal range. The haemoglobin demonstrated in the urine and methaemoglobin and oxyhaemoglobin in the serum in one case only might well be due to causes other than blackwater fever.]

A. W. Woodruff

TRYPANOSOMIASIS

East Africa High Commission. **East African Tsetse and Trypanosomiasis Research and Reclamation Organization. Annual Report 1952** [Lewis, E. A., Director]. 58 pp. 1953. Nairobi.

The work of the Organization, now under the directorship of Dr. E. A. Lewis, continues along the lines developed under the administration of the late Dr. H. M. O. Lester who, at the beginning of the year, had been transferred to the Federated States of Malaya as Director of Medical Services. Dr. Lewis in his Introduction emphasizes the advantages of close integration between research and practical reclamation in tsetse control. Although staffing problems combined during the year to reduce the number of officers in the field, good progress has been maintained. Housing and laboratory facilities at the Centre for Trypanosomiasis Research at Sukulu in Uganda are well advanced.

Dr. J. P. Glasgow writing on Tsetse Research notes that 5 of the experimental blocks at Shinyanga (No. 11 and Nos. 13–16) are now available, at least in part, for development by the territorial government. Other subjects dealt with briefly include the relationship of concentrations of *G. swynnertoni* to vegetation in block 9; the reduction of larval size and, as a corollary, the size of the adults they give rise to some weeks later, imposed by dry-season conditions acting on the parent female flies; and the familiar topic of long-term cycles in fly densities. There is some evidence of an expected increase in *G. swynnertoni* numbers.

Population studies on *G. pallidipes* in the Lambwe Valley, Kenya, are discussed more fully. It appears that there are probably 50 times as many flies as catches indicate for an area. This finding, together with general experience, helps to explain severe trypanosomiasis in cattle in areas with apparently few fly. *G. pallidipes*, contrary to the conception of it as a widely roving fly, usually flies little more than 300 yards and is loath to leave the dense thickets it frequents. In a lacustrine peninsula both *G. pallidipes* and *G. palpalis* occur on the hill-top thickets but it is now realized that the latter spends little of its time in this area which is some distance away from its classical waterside haunts.

Pupal sites continue to be investigated with special reference to their distribution in the rains. Formerly few could be found, although they certainly exist since newly emerged flies are on the wing at that time. It was long supposed that they were widely dispersed and not readily detected. Recent developments show that bare soil under overhanging logs or low thicket is a characteristic type of site for concentrations of up to 20 *G. swynnertoni* puparia during the rains. The overhanging log or twig is thought to be a " perch " for the gravid females. The puparia are hardly covered by the soil. Soil texture and shade appear to be important factors rather than temperature which, when similar used and unused sites were compared, did not vary beyond 5°C. over the seasons. Pupae of *G. morsitans* have been found in the leaf axils of *Borassus* palms. At Shinyanga *G. pallidipes* pupal sites are also characterized by " perches " in their dry-season breeding places in riverine thicket, but the sites used in the rains remain unknown. This fly's breeding habits appear to be easily disturbed by the trampling of cattle and by Africans collecting timber. Further details of larvi-position are given. Larvae always move away from light [this corrects an earlier belief to the contrary] and at 20°C., or in wet soil, fail usually to burrow before pupation; these observations are consistent with findings in wet season pupal sites.

Laboratory rearing of *G. swynnertoni*, *G. morsitans* and *G. austeni* continues successfully, but *G. pallidipes* has always failed to mate in captivity. When kept on guineapigs the *G. swynnertoni* strain slowly declined to extinction but it is still vigorous in the 10th generation when reared on sheep. Some data which compare, for humid wet-season conditions, *G. swynnertoni* and *G. austeni* show that *austeni* adults may survive a maximum of 200 to 250 days (mean = 174·5 days for the female; 166·4 days for the male) while *swynnertoni* females live up to 180 days (mean = 115 days) and males up to 170 days (mean = 105 days). The reproductive rate was 6·8 puparia per female for *G. austeni* and 4·5 puparia per female for *G. swynnertoni*. The rigours of dry season conditions—an unusual experience for *G. austeni* in its natural habitat—greatly reduced its productivity, survival and pupal size. Physiological research demonstrates that the rapid fat loss in captured flies (0·5 mgm. of fat) can be replaced by synthesis from the next blood meal which is largely protein (50 mgm. of blood) and does not contain as much as 0·5 mgm. of fat. Other work still in progress concerns the glycogen content of flies.

Of particular interest to parasitologists is the discovery by Dr. Willett that the peritrophic membrane of the tsetse fly is completely closed at the hind limit and not open like a sleeve, as reported in work elsewhere on *G. tachinoides* many years ago. This has been shown to be the state of the membrane in *G. morsitans*, *G. swynnertoni*, and *G. pallidipes* and it is also established for *G. tachinoides* in the present researches. The length of the peritrophic membrane increases with the age of the fly.

The long work of preparing antisera for identifying the blood in the gut of tsetse flies, for which Mr. B. Weitz of the Lister Institute has been largely responsible, is almost complete. Sera collected include elephant, 'hyrax', zebra, rhinoceros, warthog, giraffe, buffalo, roan, sable, oryx, 3 species of hartebeest, topi, wildebeest, waterbuck, reedbuck, eland, greater kudu, bushbuck, duiker, oribi, steinbuck, klipspringer, dikdik, Grant's and Thomson's gazelle, gerenuk, impala, various carnivores, primates and other animals.

Mr. W. H. Potts, who has retired, has completed his parts of the all-Africa map of tsetse distribution, which is to be published soon.

In some collaborative work on defoliants and arboricides, variable effects, from immediate killing (unusual) to defoliation delayed for 3 months, were observed according to the species of plant concerned.

An account of Trypanosomiasis Research is given by Dr. M. A. Soltys. Some new fly-transmitted strains of *T. brucei* have been established, one, the Shinyanga III strain, being kept both in monkey and in sheep for comparative studies with the *T. brucei* (Shinyanga I) strain kept in monkeys and the sheep strain of *T. rhodesiense* kept for the past 18 years. Important studies by Dr. E. Burtt are being made of the separate infections of *T. brucei* and *T. rhodesiense* in a variety of animals. Both species kill rats, rabbits, sheep, Thomson's gazelle (*T. rhodesiense* being invariably fatal to this gazelle) and *Cercopithecus* monkeys in about 2 to 3 months, the cerebrospinal fluid having a high cell count and parasites by this time, but not by the 25th day of an infection. Dikdik are known to be killed by *T. rhodesiense* but test of *T. brucei* awaits captive breeding of dikdik. In reedbuck and duiker *T. rhodesiense* infections last about 3 months but with *T. brucei* infection, which becomes mainly cryptic from an early stage, persists for about 16 months. This is probably the course of normal infection before spontaneous cure. *T. brucei* infections are known to be infective to fly as late as the seventh month of the disease. Wild pig are now being

investigated with *T. brucei*; *T. rhodesiense* kills them. It is concluded that the different durations of these 2 trypanosomes in reedbuck and duiker confirm the view that *T. brucei*, as the accepted ancestral form of game trypanosome, should show a better balance between parasite and host.

The rectal temperature of infected sheep is 1°F. higher, even in the prepatent stage, than of healthy sheep. An instance is noted of a gland infection of *T. brucei* in *G. morsitans* which died out spontaneously.

Research on antrycide, very largely the work of Mr. R. N. T. W. Fiennes of the East African Veterinary Research Organization, leads to the conclusions that curative treatment of cattle is effective only at an early stage; prophylactic treatment should be given at least once every 2 months; prophylaxis with antrycide tends to cause cryptic infections which may flare up after injections of attenuated goat virus against rinderpest; and, finally, treatment may create antrycide-resistant strains. A field experiment is in progress to test the possibility that an acquired immunity may develop in cattle protected with antrycide. This work is being done at Mariakani with field transmission of *T. congolense* and *T. vivax* carried by *G. austeni*.

A new drug (528) [this *Bulletin*, 1953, v. 50, 389] does not promise to be better than antrycide. At dosages of 5 mgm. per kgm. it is toxic, affecting kidney and bone marrow. It failed to cure a case of infection with antrycide-fast *T. congolense*.

An anti-trypanosome substance can be extracted from the spleen and liver of an infected animal. It prevents the infection of mice (at least for 6 weeks) from homologous trypanosomes if the parasites are suspended at 37°C. for 3 hours in the extract before inoculation into the mice. Mice in control series die within 6 weeks. This discovery is still being investigated.

A scheme for investigating the rôle of biting flies, other than tsetse, in the transmission of cattle trypanosomiasis has been planned for an area in south-west Uganda in collaboration with the Uganda Veterinary Service.

Experimental Reclamation is presented by Mr. J. Ford who first notes the significant advances in this sphere which aerial survey, largely carried out by the Royal Air Force and the Colonial Surveys Unit, has made possible. Particularly valuable is the increased speed with which it is now possible to formulate initial plans for reclamation; the detection of elusive foci which hinder the completion of a scheme is greatly facilitated by aerial survey photographs. There is a discussion of the difficulties of costing reclamation work. Much expense is often incurred in maintaining camps, supplies, and roadways in isolated territory. Some schemes envisage a use of the reclaimed land which may well in time compensate the capital outlay but often the result is never likely to be expressed except in terms of a general benefit and improved welfare of the African settlers. The problem, in general, is not the cost of tsetse control measures but the cost of other services and development which must follow; some types of tsetse country can be cleared for as little as 1s. per acre, but it remains uncertain whether the land is suitable for any of the needs at present pressing on the territorial governments.

Some of the difficulties are illustrated by the following accounts of the work in progress.

The Lambwe Valley Scheme: an area in Kenya near Lake Victoria where the transmission of *T. vivax* (and *T. congolense*) by *G. pallidipes* prevents the settlement of fertile land. The Organization clears uncultivable land, while settlers, assisted by paid labour, are responsible for cultivable land. It is at present a question of clearing 300 acres of bush forming permanent tsetse foci in 8 square miles of country. The fly is related to bush in the

following ways: permanent dense fly in dense continuous thicket; permanent but small numbers in mixed thicket and woodland; open woodland seasonally invaded, especially if close to either of the former types of thicket; thickets on hills harbouring permanent fly (with a peak in the hot season contrary to the circumstances elsewhere); and wooded gullies invaded by fly from adjacent fly foci. Selective clearing based on these findings is as follows: complete clearing of dense thickets, hill thickets and the extensions of gully thickets up the hill-sides. No clearing of open woodland is then necessary, the main foci having been removed; mixed thicket and woodland needs only partial clearing. Trees over 20 ft. in height remain untouched. The cost is about 2s. per acre for the whole 8 square miles. Although the whole valley shows a remarkable decline in *G. pallidipes* (possibly a long-term cycle), the reduction of fly in the cleared area, allowing for this natural recession, is about 50 per cent. The percentage of infected flies is also reduced. Here, as in Ukerewe in Tanganyika in 1945, the first phase of effective control may be the elimination of infective flies before the eradication of the fly. In the preliminary surveys it was shown that the highest infection rates occurred where the fly was most abundant in the dense thickets, it being supposed that fly survival was maximal in these favourable foci.

The Masai Pilot Scheme: *G. pallidipes* has advanced northwards since the early 1930's along Masai grazing grounds and into Kenya, where European cattle herds have been infected. The control scheme calls for clearing of riverine thickets and for plans to prevent regeneration. There may be need to undertake also game control to prevent invasion by *G. swynnertoni*. This work is in progress and is to be coupled with utilization of the land after its reclamation.

The *Tabora Experimental Reclamation Scheme*: this scheme, begun in 1948, was planned to eliminate *G. morsitans* from a salient of the western fly-belt abutting on the important town of Tabora. The work is virtually complete. Approximately 12½ square miles in an area of 130 square miles were cleared selectively at a cost of about 1s. per acre for the whole salient. The final phase of the clearing was accompanied by a reappearance of some flies in neighbouring sectors previously made fly-free in the earlier part of the work. This is interpreted, with some confidence, as a random dispersal of fly as their final focus in the salient was destroyed. It is believed not to be a matter for concern. Another disquieting feature, until causes were sought, was a sharp fall in 1952 in fly density in the control area on the Wala River. But this is explicable from the fact that the breeding grounds were inundated for a prolonged period by unprecedented rains in 1951–1952. This territory near Tabora is the sort for which no agreed scheme can yet be devised for the satisfactory use of the land reclaimed. But the work has been very profitable as an experimental study, the town of Tabora is relieved of the fly menace, and only a low incidence of trypanosomiasis has infected cattle on experimental pastures in the salient.

The Mkata Pilot Reclamation Scheme: this has been devised to provide fly-free wet-season grazing of about 40 sq. miles for 25,000 head of cattle when the Mkata Plains in Tanganyika, the dry-season grazing ground, are flooded in the rains. The scheme calls for selective clearing against *G. morsitans*, but also some riverine foci of *G. pallidipes* and *G. austeni*. The cleared area is to be protected by a horseshoe-shaped sheer clearing, 1 mile wide, reinforced by discriminative clearing to a depth of 2 miles outside the sheer-felled barrier. The work has just begun.

The Ankole Pilot Scheme: for some years *G. morsitans* has continued to extend rapidly northwards through the Ankole grazings in Uganda. The scheme was launched to stop further invasion and to reclaim lost ground. Priority was given to stemming the advance of the fly. A survey—by ground and air—demonstrated 13 different types of vegetational association in the area. Of these, 8 can be disregarded. Associations of *Acacia hebecladoides*, *Albizzia* sp., *Rhus* thickets on termitaria, and *Acacia shenocarpa* are of first importance. Certain other associations require careful survey to decide their significance. Clearing the important association amounts to about 10 per cent. of the area, requiring 6 man/days per acre. Costs for clearing absorbed only 44·8 per cent. of funds, while housing and road-making, etc., accounted for 37·7 per cent. These expenses arose because the work to stop further fly-invasion called for a labour force of 300 camped 70 miles from the nearest main centre of supplies. The results of the protective clearing against further advance appears to have been successful. There appears also to be some early success in the reclamation of lost ground. There is a good deal of description of the botanical features and structure of the bush and thickets in this area. Stress is laid, as elsewhere, on the importance of double-storey foliage levels derived from associations of tall trees with shorter trees and bushes. There is evidence that removal of the high trees only is effective against the fly. The long time required before tall trees could regenerate to their normal size is a particularly favourable aspect of this discriminative clearing. The whole scheme is closely linked with plans for the use of reclaimed territory.

The report concludes with fairly detailed accounts of advisory work in a number of areas in Tanganyika, Uganda and Zanzibar. *D. S. Bertram*

DIRECTORATE OF COLONIAL SURVEYS: **Distribution of Tsetse Species in Africa.** [Maps compiled and drawn by Directorate of Colonial Surveys from information collated by W. H. POTTS, Chief Entomologist, East African Tsetse & Trypanosomiasis Research & Reclamation Organisation (Mean Scale 1:5,000,000).] Sheets 1 and 2: D.C.S. (Misc.) 48a and b. On sale by Edw. Stanford, Ltd., 12/14 Long Acre, London. (Price 4s. 6d. net each.)

Sheet 1 is a map of West Africa bounded by the longitudes 18°W. and 14°E. and latitudes 16°N. and 4°N. Tsetse records occur in this area roughly south of a line from Dakar to Lake Chad. Sheet 2 maps the region to the east of that shown in Sheet 1 as far as longitude 46°W. between the same lines of latitude but with an extension in Somaliland southwards to the equator. Each sheet measures 3 feet by 1 foot 8 inches and the mean scale is 1:5,000,000.

The distribution of the 20 species of *Glossina* is indicated by black symbols for isolated records as well as by colour washes for certain species which occur in large belts. Also shown are the tsetse-free areas and those parts of the country thought to contain tsetse but where the identity of the species is unknown. The symbols and colours are those adopted in 1948 by the International Conference on Trypanosomiasis. The information was collected by Mr. Potts from published records, museum specimens and other sources; data were also supplied by territorial organizations through the International Scientific Committee for Trypanosomiasis Research.

It has been possible to show the known distribution of the species in considerable detail and without confusion partly because of the use of

large-scale maps and also because of the wise selection of symbols and colours which stand out so boldly from the subdued printing of the geographical background and the greyish but perfectly legible lettering of the place names.

In so far as the factual details are concerned this is the kind of work about which critical comment is impossible until it has been put to practical use, when its value can be more fully appreciated.

It is certain, however, that students of African affairs and workers on that continent, whether they be entomologists or interested in other sciences, medical or veterinary officers, geographers, missionaries, business men or administrators, all will at some time have need to consult these maps and be grateful. Many of them will be able to appreciate the immense research involved and will feel that the compiler and the printers are to be congratulated on having brought their careful labours to so fine a conclusion, and they will look forward with confidence to the publication of the 3rd and final sheet. *H. S. Leeson*

SCHOENAERS, F., NEUJEAN, G. & EVENS, F. Valeur pratique de la réaction de fixation du complément dans la maladie du sommeil à *T. gambiense*. Ire Partie : Le diagnostic de la maladie. [**Practical Value of the Complement-Fixation Reaction in Sleeping Sickness due to** *T. gambiense*; **I. Diagnosis**] *Ann. Soc. Belge de Méd. Trop.* 1953, Apr., 30, v. 33, No. 2, 141–69. [27 refs.]

In 1907 Citron showed that the complement-fixation reaction was applicable to trypanosomiasis; its practical value, it was hoped, would prove to be greatest in the diagnosis of human Chagas's disease and in equine dourine, both of them diseases in which a parasitological diagnosis is difficult. Antigens prepared from organs rich in parasites often were highly anticomplementary, but those prepared from cultures of *T. cruzi* proved to be satisfactory. As the other species of trypanosomes pathogenic for man are difficult to cultivate satisfactorily, antigens could not be prepared from them by this method, but the trypanosomes in heavily infected bloods of animals have been concentrated and freed from the other cellular and serum contents by various techniques. The suggested methods of preparing antigens from these sources are mentioned, and the value of the complement-fixation tests in various forms of trypanosomiasis reported by other workers is considered. Only in dourine and in Chagas's disease has this test so far been much employed as a standard method of examination; in the other trypanosomiases it has been used for research purposes rather than for its practical application in the field.

The authors have done complement-deviation tests on 66 control African sera of which 20 were Wassermann-positive, and on 125 sera from untreated human cases of *T. gambiense* trypanosomiasis in which the diagnosis had been established by the recovery of parasites. The antigen they used for the performance of their test was prepared from the blood of rats heavily infected with the Watson strain of *Trypanosoma equiperdum*. [The details of the preparation of the antigen and of the performance of the test should be sought in the text.] The results they obtained with the various sera are classified as a strongly positive, a weakly positive, or a negative complement fixation.

None of the 66 control sera gave a positive complement-fixation test with their technique. Of the 125 sera from cases of trypanosomiasis 119 (95·2 per cent.) gave positive tests; 22 (18·4 per cent.) of these 119 were feebly

positive and 97 (81·6 per cent.) of them were strongly positive. These results show the high degree of specificity of the test in detecting human trypanosomal infection. Of the 6 trypanosomiasis cases the sera from which did not give positive tests, one was anticomplementary, but the other 5 gave completely negative tests. An enquiry into the cause of these 5 negative tests suggested that the first of them was done too early in the disease for the patient to have developed antibody; the second patient was developing a fulminating infection, so suggesting an absence of immunological defence; the third patient was in poor condition, and his serum was examined when there were no parasites in the blood or glands and there was rapid invasion of the central nervous system—this suggested a diminution in his antibody content; and the remaining 2 sera gave false negative tests for which no adequate explanation was forthcoming.

The findings in these cases of trypanosomiasis as revealed by the accepted methods of diagnosis, which included a search for parasites by gland puncture, examination of thick blood films, haemoculture, and examination of the cerebrospinal fluid [CSF], and also examination of the CSF cellular content, the CSF protein content, the Weichbrodt [globulin] reaction of the CSF, and the colloidal benzoin reaction, in relation to the results of the complement-deviation test are set out comparatively in a series of tables. From analysis of these tables it is concluded that the complement-fixation test detects at least 10 per cent. more cases of infection with *T. gambiense* than does any single method used alone for the recovery of parasites, and that this test is much superior to the other non-specific techniques employed in the classification of the disease and its evolution. The complement-fixation test is most strongly positive when there are demonstrable parasites in the blood and in the lymph. When they are absent from these media it is less strong, but it rises also with the presence of demonstrable parasites in the CSF. The greater the clinical involvement of the central nervous system the less strongly positive does the complement-fixation test become as a general, though not an absolute, rule. The complement-fixation test is a specifically diagnostic test for human trypanosomiasis, but the intensity of the reaction varies with the evolution of the disease; it is greatest when parasites are demonstrable by the standard methods of examination.

A. R. D. Adams

Jonchère, H., Gomer, J. & Reynaud, R. Contribution à l'étude de produits à radical mélaminyl dans le traitement de la trypanosomiase humaine à *Tr. gambiense*. [**Melaminyl Compounds in the Treatment of Gambian Sleeping Sickness**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 3, 386–96.

The International Scientific Committee for Research on Trypanosomiasis recommended that further trials of melarsen oxide in sleeping sickness should be made [this *Bulletin*, 1952, v. 49, 241; 1951, v. 48, 339]; the authors give the early results of its use in two places in French West Africa, *viz.*, Bobo-Dioulasso and Ham. They cannot draw any definite conclusions because the number of patients treated is too small and only about half of them were examined 6 months later; observation of these patients should be continued. The method and precautions advised by Jonchère [this *Bulletin*, 1953, v. 50, 200] were adopted; a 3 per cent. solution of melarsen oxide in propylene glycol was injected intravenously, the patient being in hospital and fasting.

At first the authors used a dose of 2·5 mgm./kgm. and later 3 mgm./kgm.; early cases were treated with a single course of 3 daily injections

while more advanced new cases and old cases (resistant to other drugs) were given 2 courses at an interval of 3 weeks to a month. The smaller dose was given to 19 patients; 11 had a single course, 1 had only 1 dose because of massive albuminuria, and 6 had a second similar course; 14 other patients had a course of 3 daily injections of 3 mgm./kgm. and 9 of these received a second similar course. All the patients showed temporary clinical improvement; of the 18 patients receiving a course of 2·5 mgm./kgm., 13 maintained their improvement, the drug caused death in 1 (an arsenic-resistant case), and 4 relapsed. Of the 14 patients who received 3 mgm./kgm., of whom 9 had a second course, the condition of 8 who were examined after 3 months was favourable.

The authors conclude that 2·5 mgm./kgm. is too small a dose, 3 mgm./kgm. is better, but more time is needed to judge its value. Melarsen oxide is very toxic, has a very narrow margin of safety, and should not be preferred to Mel B. It may be stated that Friedheim's melanyl compounds will cure a considerable number of patients who would not be saved from death by other drugs, but their toxicity prevents their general use in the field; it is reasonable to expect that chemical research will find some similar but less toxic compound. [See also this *Bulletin*, 1953, v. 50, 288; 1952, v. 49, 378, 605.] *J. F. Corson*

LOTTE, A. J. Interprétation des résultats expérimentaux de la chimioprophylaxie dans la maladie du sommeil à *T. gambiense*. [**Interpretation of the Results of Chemoprophylaxis in Sleeping Sickness**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 3, 397–406, 1 chart.

The author has published previously a study of the epidemiology of sleeping sickness and the effects of chemoprophylaxis from 1947 to 1951 in many areas of French West Africa [this *Bulletin*, 1952, v. 49, 246]; in the present paper he examines statistically the results of chemoprophylaxis in the years 1950 and 1951, as the earlier figures are not sufficiently important or homogeneous for statistical treatment. He gives certain conclusions as laws or corollaries: mass prophylactic injections of pentamidine at 6-monthly intervals will protect a population, but it has not been proved that annual injections will do so. Protection is inversely proportional to the number of untreated persons left voluntarily or involuntarily as controls; it will be more effective in proportion as the treated zones are more homogeneous, the area larger and the duration of treatment longer. In certain endemo-epidemic areas 3 injections at 6-monthly intervals are better than 2 in order to reach the lowest (liminal) index of infection; this is the lowest positive index, a single infected person, and therefore, for instance, cannot be less than 0·1 per cent. in a community of 1,000 persons. It remains to be seen whether the liminal index is a rate compatible with survival of the trypanosomes in nature. Some examples are given to show that in a given region there is a rate of "circulating virus" below which, if there is no importation from outside, the cycle, trypanosome-man-fly, is biologically broken.

The last part of the paper gives a graphic representation of the prophylactic action of pentamidine and the application of mathematical formulæ to the position in various sleeping sickness areas. In the epidemic form, chemoprophylaxis gives rapid, spectacular results; in the active endemic form it must be tenacious and prolonged; in the residual endemic form chemoprophylaxis is open to discussion. When means are limited, the

active endemic zones should have preference as they are the means of survival of the trypanosomes in nature. *J. F. Corson*

MORNET, P. Carte de répartition des trypanosomes-pathogènes des animaux domestiques en A. O. F. [**Map of the Distribution of the Pathogenic Trypanosomes of Domestic Animals in French West Africa**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 3, 308–11.

Owing to such causes as the number of species of trypanosomes and of vertebrate hosts, states of premunition liable to break down at times, mixed infections, and the movements of animals from place to place, it is difficult and perhaps impossible to define exactly the geographical distribution of the pathogenic trypanosomes of domestic animals. The author only aims at giving a general idea of the position. In the absence of special surveys his information is derived from examination at Dakar laboratory of samples taken by veterinary officers during their tours of the country. *Trypanosoma theileri*, *T. uniforme* and *T. simiae* are excluded and only 4 species, *T. evansi*, *T. vivax-cazalboui*, *T. brucei* and *T. congolense*, are put on the map. The samples examined were taken chiefly from oxen, horses and dogs and less from pigs, sheep, goats and cats. The following distribution was found: *T. vivax* from Lat. 17°N. to 3°N. and from Long. 16°W. to 14°E., *i.e.*, from the Sahara to the south coast and from the west coast to Lake Chad; *T. evansi* is limited to the habitat of the dromedary in the Sahara, this being practically the only infected domestic animal though the horse may be susceptible; *T. brucei* and *T. congolense* occur together in the tsetse-infested area from Lat. 14°N. to the sea coast. The relative proportions found were: *T. vivax* 48 per cent., *T. congolense* 28 per cent., *T. brucei* 19 per cent., *T. evansi* 5 per cent. *J. F. Corson*

BROWNING, C. H., ADAMSON, H. & KEPPIE, A. A. N. **Acquired Immunity to** *Trypanosoma congolense*: **Further Observations.** *J. Path. & Bact.* 1953, Jan., v. 65, No. 1, 137–41.

Chronic infections with *Trypanosoma congolense* in mice resist phenanthridine drugs more than acute infections owing to the immunological state of the trypanosomes, and immunity reactions have been shown to be important in the cure of trypanosome infections with a drug. Acquired immunity after cure of strain I and II *T. congolense* infections was examined by BROWNING and CALVER [this *Bulletin*, 1945, v. 42, 259, 704]; the work recorded in this paper refers to strain III, the " Busimbi " strain.

The original strain, inoculated from mouse to mouse at the acme of the infection, is called αOS. If a mouse lives for more than a week after acme, the infection is chronic and is called χO; the survival period may be prolonged by giving a non-sterilizing dose of the drug. The strain obtained by inoculating a fresh mouse from a χO mouse and then continuously propagating it at acme is called αDiS and a strain obtained similarly from a χDi mouse is called αDiiS (O = original, Di, Dii, etc. = once derived, twice derived, etc.). Infections with derived strains usually run the same course as those with the original strain but some may be less virulent. A cured mouse is only called immune when reinoculation with a massive dose of trypanosomes fails to infect it. The results of experiments are shown in the Table.

TABLE

T. congolense III (" Busimbi "): results of reinoculation of mice cured of a first infection.

Series	Strain used for 1st infection	Strain used for reinoculation	No. of immunes in total inoculated	Percentage immune
1	αO	αO	91/97	92
2*	αDi	αDi (homologous)	50/56	
3	αO	χO	3/23	8
4	αDi	χDi (homologous)	0/14	
5	αO	αDi	0/96	0
6*	αDi	αO	3/59	7
7*	αDii	αDi (homologous)	3/25	
8	χO	χO	1/33	3
9	χO	αO	38/39	97

* Combined results from experiments with a number of distinct strains.

Series 2. Reinoculation with the same αDiS as that used for the first infection.

Series 4. χDi mice originally inoculated with the same αDiS as that used for the first infection of the mouse reinoculated from the chronic animal.

Series 7. αDiiS derived from a χDi mouse originally inoculated with the same αDiS as that used for the reinoculation.

Series 8. Each cured χO mouse was reinoculated from another χO mouse; all were originally infected with αOS.

Summary and conclusions. The virulence and immunological behaviour of the original acme strain, after full accommodation to mice, remains uniform for years and the absolute resistance of the cured mice to reinoculation with the homologous strain is likewise retained for years. The less virulent strain I immunizes more of the inoculated mice while the more virulent strain II immunizes fewer; only 50 per cent. of αOS mice, cured of strain II, are immune to homologous reinoculation and only half of these 50 per cent. are immune to a second reinoculation.

As chronicity develops there seems to be a " continuing antigenic flux "; a cured χO mouse is usually susceptible to inoculation from another χO mouse which was originally infected with the same acme strain. Three αDi strains, after passages at acme for several months, could still infect cured αOS mice, but with *T. congolense* I, αDiS reverts to αOS within 5–12 passages. When a number of mice are inoculated simultaneously from a single strain III χO mouse, the infections may not be identical immunologically, *i.e.*, the cured mice may not all be immune to reinoculation with an αDiS from the same χO mouse; the host influences the immunological characters of a derived strain. Earlier antigenic characters may reappear in the antigenic flux; some mice, cured of strain III αDiiS, were immune to αOS. Reappearance of αO antigen was more likely than persistence of αO trypanosomes; with *T. congolense* I, however, αO antigens persisted in an αDiS. The results of repeated reinoculation of mice cured of strain II OS indicate either that the immunity of the hosts fluctuated or that the antigens of the acme strain alternated in their configuration.

These experiments do not support the view that active immunization would combat the natural spread of *T. congolense* infections.

J. F. Corson

LAUNOY, L. & PRIEUR, Marie. Documents préliminaires sur les normes de toxicité et d'activité trypanocide expérimentale, du mélaminyl-4-phénylarsénodithioglycérine. [**Preliminary Data on Toxicity and Activity in Experimental Trypanosomiasis of Melaminyl-4-phenylarsenodithioglycerol**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 3, 300–303.

As a result of discussion at the third meeting of the International Scientific Committee for Research on Trypanosomiasis held in June, 1951, it was decided that further investigation should be carried out on melaminyl-phenylarsenoxide and on the compound resulting from its combination with BAL (dithioglycerol), prepared with a view to decreasing the toxicity of the arsenical. Data presented at the subsequent meeting led to further investigations on the last-named compound with the results presented here. The tests were made on male mice weighing 18 to 20 gm. with solutions of the drug in anhydrous propylene glycol given subcutaneously. The LD50 was found to be 0·6 mgm. by this route. Activity was determined in mice infected with different species of trypanosomes including *T. congolense*, *T. brucei*, *T. equiperdum*, *T. evansi*, *T. gambiense*, *T. annamense* (normal and arsenic-resistant), and *T. equinum*. Treatment was started when a small number of trypanosomes appeared in the peripheral blood. All infections were sterilized by doses ranging from 5 to 30 μgm. of drug except that due to *T. congolense*, which proved resistant to a dose of 300 μgm. The observation period was one of 30 days. *J. D. Fulton*

HEISCH, R. B. & GARNHAM, P. C. C. **Fortuitous Xeno-Diagnosis of Bat Trypanosomiasis.** [Correspondence.] *Nature.* 1953, Aug. 8, v. 172, 248, 2 figs.

During an investigation on the East African Coast the authors examined mosquitoes which had been fed on bats (*Nycteris capensis*) infected with malaria parasites, and found numerous flagelletes in the mid-gut. These were motile and all appeared to be in the crithidial stage; many dividing forms were seen. They have found trypanosomes in the blood of 25 per cent. of bats examined. The discovery that development and multiplication take place rapidly in *Aëdes simpsoni* and *Aëdes lineatopennis* suggests that a mosquito may be the vector of the trypanosomes in nature. It seems probable that xenodiagnosis may be a useful means of detecting occult infection.

The identity of the trypanosome is doubtful; it may be akin to *T. heybergi*. *Charles Wilcocks*

RAMOS, A. DA S., LACERDA, J. H. DE M., BRANDO, N. N. & SAMPAIO, A. H. Mais um caso agudo de moléstia de Chagas no Município de Maracaí, Estado de São Paulo. [**Another Case of Acute Chagas's Disease in Maracai, São Paulo**] *Arquivos de Hig. e Saúde Pública.* S. Paulo. 1952, Sept., v. 17, No. 53, 429–33, 3 figs. English summary (4 lines).

SCHIAVI, A., DE LIMA, A. R. & RAMOS, A. DA S. A desinsetização da área central do Estado de São Paulo, visando os vetores da Moléstia de Chagas. [**House Spraying of the Central Region of the State of São Paulo for the Control of Triatoma Infestans**] *Arquivos de Hig. e Saúde Pública.* S. Paulo. 1952, Mar., v. 17, No. 51, 117–21. English summary (5 lines).

The authors briefly describe a campaign against *Triatoma infestans*, main vector of Chagas's disease in Brazil. The area of operations was a central

region of the state of São Paulo. It comprised an area of 3,327 sq. km. with a population of 73,000, two-thirds of whom were urban dwellers. Much of the rural land was occupied by coffee plantations of various sizes. Of some 13,000 houses inspected, 369 contained *Triatoma*, and of 782 blood samples tested, 15 to 18 per cent. were positive for Chagas's infection.

The house spraying was done by operators of the Malaria Prophylaxis Service, using "jeeps" to travel about. Mixtures of DDT and *gamma* BHC were usually employed as aqueous suspensions. A dose of 0·25 gm. BHC (10 to 12 per cent. *gamma* isomer) was applied. The cost of insecticide amounted to about 50 per cent. of the total budget.

This spray treatment was found to have a good initial effect on *Triatoma* and other domestic insects, but the residual effect was poor. The total cost of the campaign in Brazilian currency was Cr $609,326. [About 50 Cr $ are equivalent to £1 sterling.] *J. R. Busvine*

DEANE, L. M. & MARTINS, Regina. Sôbre um tripanosoma encontrado em macaco da Amazônia e que evolui em triatomíneos. [**Trypanosome found in Amazonian Monkey, with Development in Triatomids**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1952, Jan., v. 4, No. 1, 47–61, 72 figs. (4 coloured) on 7 pls. [25 refs.] English summary.

Description of a trypanosome from a Capuchin monkey, *Cebus apella apella*, of the Amazonian region of Brazil. The trypanosomes, which were extremely scanty in blood, belong to the *lewisi* group. They measure from 40·5 to 44·8 μ in length (mean 43 μ). The body is drawn out to a point at the posterior end, the nucleus is situated near the middle of the body, the kinetoplast is small, lying near the margin at some distance ($7{\cdot}3-11{\cdot}3\mu$) from the posterior extremity, and the flagellum has a free portion of $7-8{\cdot}6\mu$.

When laboratory-bred Triatomid bugs (*Panstrongylus megistus*, *Triatoma infestans* and *Rhodnius prolixus*) of different ages were fed on the infected monkey, the trypanosomes underwent a cyclical development in their alimentary canal, giving rise to leishmanial, crithidial and trypanosome stages in the duodenum, stomach and rectum. These forms were also seen in small numbers in the faeces, but there was no development in the anterior part of the intestine, or in the haemolymph, salivary glands and mouth parts.

This trypanosome does not appear to be pathogenic to its host, and attempts to infect laboratory animals (mice, guineapigs and dogs) were unsuccessful.

The authors compare this trypanosome with others recorded from South American monkeys, and conclude that it is a distinct species, for which they propose the name *T. diasi* sp.n.

Since the new trypanosome might be encountered in the same wild mammals and bugs which harbour the human trypanosomes, *T. cruzi* and *T. rangeli*, attention is drawn to the importance of identifying and differentiating flagellates detected in the course of surveys for human trypanosomiasis.

The paper is illustrated by numerous figures, including a coloured plate. *C. A. Hoare*

LEISHMANIASIS

HENRY, A. F. X. Kala-azar et paludoflocculation. [**Kala Azar and Malaria Flocculation Tests**] *Rev. Paludisme et Méd. Trop.* 1953, Jan. 15, v. 11, No. 103, 7–9.

The author states that at the beginning of his studies he observed, as well as melanoflocculation (quasi-specific for malaria), a flocculation of certain sera in distilled water, 1 in 5 dilution, for which he proposed the term hydroseroflocculation; this reaction did not indicate malaria specifically, although it often occurred with the serum of persons with malaria. Other workers have used these phenomena in the diagnosis of malaria and other diseases; the author considers it necessary to question certain assertions.

The first assertion is that melanoflocculation is positive in two diseases, malaria and kala azar. This the author denies; he states that, if the test is done properly, a positive result is obtained in kala azar only when the patient also has malaria. He points out that heating serum to 56°–57°C. for one hour prevents the melanoflocculation reaction from occurring, but that hydroseroflocculation will occur also with heated serum. He therefore suggests that to eliminate errors a control should be run with heated serum and if both are positive the result is annulled. He reports a case in which a young girl had been treated for malaria for a long time and in which he was able to eliminate the diagnosis of malaria by this technique; the formol-gelification reaction was strongly positive with dense opacity [aldehyde reaction + + +] and the patient responded to treatment for kala azar.

The other assertion is that in diseases other than kala azar the hydroseroflocculation test never achieves a density beyond 100 units on the Vernes scale. This also he can contradict from experience with cases of splenomegaly in which kala azar has been excluded; the opacity in the hydroseroflocculation test frequently reaches to 200 Vernes units. *L. E. Napier*

SEN GUPTA, P. C. & BHATTACHARJEE, B. **Histopathology of Post-Kala-Azar Dermal Leishmaniasis.** *J. Trop. Med. & Hyg.* 1953, May, v. 56, No. 5, 110–16, 7 figs. [12 refs.]

At a Calcutta kala-azar clinic, the number of cases of post-kala-azar dermal leishmaniasis outnumber those of the visceral infection. A histological study has been carried out on biopsies from 71 patients with these lesions. Three types of lesion, namely the hypopigmented, the erythematous and the nodular, are described separately.

In the hypopigmented lesion the changes in the epidermis are minimal except that there is a decrease in the pigment in the basal layer. In the dermis there is granulomatous infiltration, consisting of histiocytes and lymphocytes associated with vascular proliferation, in the sub-papillary layer, which may extend to deeper layers in chronic cases. The infiltration develops in small isolated islands. There may be some oedema of the papillary layer.

In the erythematous lesions, again in the epidermis the changes are slight, but as well as a reduction of pigment in the basal layer there is distinct dwarfing of the rete cones. In the dermis, the granulomatous infiltration is more marked and it extends upwards into the papillary layer and down into the deeper layers of the dermis; the foci of infiltration tend to coalesce. There are usually a considerable number of plasma cells in addition to histiocytes and lymphocytes. A focus often consist of several histiocytes

surrounded by lymphocytes and plasma cells. There is considerable oedema of the upper layers of the dermis, and there is usually marked dilatation of the vessels of the papillary and sub-papillary layers, with perivascular thickening of the latter.

In the nodular lesion, the epidermis is markedly thinned and flattened and reduced to a few layers only. The pigment granules are reduced considerably and the rete cones are absent. Despite the thinning there are never any breaches in the continuity of this layer. In the dermis, a granuloma consisting of histiocytes, lymphocytes and plasma cells with occasional giant cells and numerous newly-formed blood vessels extends right up to the basal layer of the epidermis. There is often considerable thickening of the blood vessels, but as in all types of lesion of this condition there is no thickening of the intima.

Parasites were seen in all 3 types of lesion; they were very scanty in the hypopigmented, a little easier to find in the erythematous, and numerous in the nodular lesions. The finding of leishmania was facilitated by the use of a special haematoxylin stain and by the Feulgen reaction.

The changes that the lesions underwent as a result of specific treatment were studied; it was noted that increased vascular dilatation always preceded cure and that the vascular dilatation was the last to disappear. It is suggested that this accounts for the slow improvement that occurs in the least vascular of these lesions, the hypopigmented.

[This paper adds materially to our knowledge of this interesting late dermal manifestation of infection by *Leishmania donovani.*]

L. E. Napier

Torres Muñoz, F. Leishmaniasis cutánea en la región de " Los Tuxtlas ", del Estado de Veracruz (México). [**Cutaneous Leishmaniasis in Los Tuxtlas, Vera Cruz, Mexico**] *Medicina.* Mexico. 1953, June 10, v. 33, No. 677, 241–4, 3 figs.

Just over 40 years ago Harald Seidelin, when studying yellow fever and other diseases in Yucatán, Mexico, was told of cases of chronic ulceration affecting the ears of men working with chicle gum [the basis of chewing-gum] in Mexico. Investigating these, Seidelin found *Leishmania* and reported his findings in the *Yellow Fever Bulletin* [this *Bulletin*, 1913, v. 1, 246]. Since that time several have reported the presence of the disease in Mexico, and in the present paper the author tells of 21 patients, one female of 55 years with both ears affected for 12 years past, and 20 males, ranging in age from 15 to 90 years; 11 of the patients were 50 years of age or more, in all of whom one or other ear was attacked. One man of 67 had had the disease for 38 years. In Seidelin's day cure was obtained by local application of pure carbolic acid with a brush; now, good results are obtained by antimonial injections, Glucantime and Repodral.

H. Harold Scott

Biagi F., F. Intradermo reacciones con leishmanina en Escárcega, Camp., (Méx). [**Intradermo-reaction (of Montenegro) in Escárcega, Campeche, Mexico**] *Medicina.* Mexico. 1953, June 10, v. 33, No. 677, 255–60.

Escárcega is a district of 3,000 inhabitants in the wooded area of Campeche State, and " chicle ulcer " occurs endemically there. The Montenegro reaction was tried on 84 persons and 36 proved positive. Twenty-six had not worked in the woods, had no ulcers or signs of any in the past and

all were negative; 58 had worked there and 36 reacted positively. The people go to the woods for 4 reasons: to extract the gum at the rainy season; to cultivate maize; to cut wood and to construct roads. The first two contribute most of the positive reactors and the numbers increase with the length of time the workers are engaged in the industry. From 1–2 years, 1 out of 8; 2–5 years, 6 out of 12; 6–10 years, 6 out of 11; 11–15 years, 9 out of 12, and 16–30 years all of 10. A considerable proportion, 6 of 28 men and 6 of 8 women, were subclinical and showed no obvious lesions. The author states, however, that sex plays little or no real part in incidence; women appear to be less affected because fewer of them are employed and those that are stay for a shorter time.

The Montenegro reaction is not interfered with by toxoplasmosis or tuberculous infection, the 3 cutaneous reactions are quite distinct. The author summarizes his investigations by saying that of 58 persons going to work in the woods 24 suffered from cutaneous leishmaniasis and the average time these had been so working was 14 years; that each year 34 per 1,000 men are infected for the first time and that in the State of Campeche there are some 243 patients suffering from the disease. [For previous references to the Montenegro reaction see this *Bulletin*, 1926, v. 23, 585; 1936, v. 33, 21; 1947, v. 44, 987; 1951, v. 48, 722; 1952, v. 49, 30, 131.]

H. Harold Scott

Floch, H. & Sureau, P. Quelques considérations sur le "pian-bois" (leishmaniose forestière américaine). [**Observations on Pian Bois; American Forest Leishmaniasis**] *Arch. Inst. Pasteur de la Guyane et du Territoire de l'Inini.* Publication No. 275. 1952, Nov., 15 pp. [10 refs.]

Forest leishmaniasis, commonly known as "pian-bois," is well known in French Guiana, but the diagnosis is rarely confirmed in the laboratory by the finding of *Leishmania brasiliensis.*

From 1939 to 1951, 623 specimens of serum from ulcers were examined but *L. brasiliensis* was only found on 44 occasions. No positive cases were found in 1950 but in 1951 there were 8 positives in 41 cases; 3 came from one family at St. Etie where a focus of infection has been recognized for some years. Visceral leishmaniasis, which is being diagnosed with increasing frequency in Brazil, does not occur in French Guiana. The secondary mucosal lesions of forest leishmaniasis are rare in French Guiana, as they are in Central American countries, but in 1951 the authors found their first case.

In 1952 the authors observed a number of cases of forest leishmaniasis, 1 from St. Etie, 5 from St. Marie-les-Mines, and 6 among members of a mission that had travelled for several weeks in forest areas in the Haut-Oyapoc. The last group were of special interest in that the incubation period could be placed at between 2 and 6 weeks, and that there was evidence that the *Phlebotomus* that transmitted the infection were themselves infected from reservoirs other than man. These cases, of which 6 were in Europeans and 6 in Creoles, are reported in detail. In all these cases *L. brasiliensis* was demonstrated. In no case was there any mucosal lesion.

There are several conceptions regarding American leishmaniasis, but that of Escomel [this *Bulletin*, 1929, v. 26, 750] is that there are two distinct forms, "uta" in which mucosal lesions are rare and are always in the form of extension from the skin lesion, and "espundia" in which mucosal lesions are frequent and are truly secondary, in that they may appear after the

primary lesion has completely healed. The former he considers occurs in the foothills, whereas the latter is essentially an infection of hot humid forest areas at sea level. He considers that uta differs from oriental sore in not producing complete immunity to subsequent infection. The authors consider that the disease in French Guiana is certainly uta, but they point out that the infection of their cases was acquired in forest areas, and that the preponderance of Europeans suggests that some immunity is enjoyed by the Guianese. Although they consider that there are many obscure points to be cleared up, they believe that their observations indicate that there are two distinct strains (or even species) of leishmania causing these lesions, as the Russians suggest is the case with oriental sore.

For the treatment of these cases they used either glucantime or anthiomaline. They considered that the latter gave better results, intravenously, in daily doses increasing up to 4 ml. for 15 days; the former was also given daily but intramuscularly, in doses up to 20 ml. for 10 days.

L. E. Napier

FEVERS OF THE TYPHUS GROUP

HARRISON, J. L. & TRAUB, R. **Rodents and Insectivores from Selangor, Malaya.** Reprinted from *J. Mammalogy.* 1950, Aug., v. 31, No. 3, 337–46.

"Investigations into the ecology of scrub typhus are involving the examination of a large number of small mammals, particularly rodents and insectivores, which are being trapped in forest, plantations, waste land, and town, in the state of Selangor, Federation of Malaya.

"An account of the distribution of rodents and insectivores trapped during 1948 is given. Forest contains many species of similar abundance, town is dominated by *Rattus rattus diardi* and *Suncus murinus*, waste land is dominated by *Rattus rattus argentiventer* with both town and forest species present, oil palm estate is dominated by *Rattus rattus jalorensis*.

"Notes on the habits of the species concerned are given. These species comprise all of the fourteen species of sciurids (but no flying squirrels) recorded from Malaya, one of the two Rhizomyidae (bamboo rats), fourteen of the twenty Muridae, one of three Hystricidae, and seven of the thirteen Insectivora.

"Tabular data are presented showing the ecological distribution of Malayan insectivores and rodents."

HARRISON, J. L. **Breeding Rhythms of Selangor Rodents.** Reprinted from *Bull. Raffles Museum.* Singapore. 1952, Aug., No. 24, 109–31, 7 figs.

HARRISON, J. L. & LIM, B. L. **Notes on some Small Mammals of Malaya.** Reprinted from *Bull. Raffles Museum.* Singapore. 1950, Dec., No. 23, 300–309.

"In the course of studying the hosts of the mite-vector of scrub typhus many small mammals have been observed and kept in captivity. Notes are given on the Sakai-names, food, and habits, of twenty-three rodents, six insectivores, two carnivores, and the flying lemur."

NICHOLS, E., RINDGE, M. E. & RUSSELL, G. G. **The Relationship of the Habits of the House Mouse and the Mouse Mite** (*Allodermanyssus sanguineus*) **to the Spread of Rickettsialpox.** *Ann. Intern. Med.* 1953, July, v. 39, No. 1, 92–102, 4 figs. [16 refs.]

This is an interesting description of the conditions of life of the house-mice and mouse-mites (*Allodermanyssus sanguineus*) in the residential areas of New York City in which rickettsialpox occurs. In the period of 6 years ending July, 1952, the number of cases of the disease reported in the city was 624. The highest incidence of the disease was in blocks of residential buildings occupied by families of the middle and upper income groups; these buildings typically are modern and are fitted with refuse shutes leading down to incinerators in the basement. Waste food thrown into the incinerators is usually burned once daily in the morning so that for most of the day and the whole of the night mice can find plenty of food scraps and the shafts of the refuse shutes give them access to all the kitchens in the building. The outside walls of the incinerators provide ideal conditions of temperature and moisture for the mites, which are often found there in large numbers, and sometimes also in smaller numbers in the runs of the mice in the kitchens. In one apartment house of this kind there were 6 sets of 7–8 large luxurious rooms occupied by a total number of 13 permanent adult residents, 8 of whom were attacked by rickettsialpox. A similar building only 20 yards distant, which was also mouse-infested, and was also surrounded by well-kept grounds, remained free from infection; this immunity was probably due to the pronounced tendency of the mouse communities to remain persistently in the same quarters so long as the food supply and nesting places were satisfactory.

In rat-infested slums the disease was less common and so were the mice. In a survey of 1,800 premises, rats and mice were found living in the same houses on only 6 occasions. Still fewer cases occurred in detached houses, each of which was occupied by a single family. *John W. D. Megaw*

JADIN, J. & PANIER, E. Un virus rickettsien du type boutonneux-pourpré isolé au Ruanda-Urundi. [**A Rickettsia of the Boutonneuse-Spotted Fever Type isolated in Ruanda-Urundi (Belgian Congo)**] *Ann. Soc. Belge de Méd. Trop.* 1953, Apr. 30, v. 33, No. 2, 119–22.

Typhus fever of the boutonneuse type has been recognized in various places in the Belgian Congo since 1933, and one of the authors (JADIN) states that he isolated the rickettsia of the disease from dog ticks in Ruanda in 1949 but was unable to maintain the strain by passage.

The present paper refers to a strain isolated in October, 1951, from a patient who became infected in the north-east of Astrida. Intracellular and intranuclear rickettsiae were found in smears of the spleen of two out of four mice inoculated with the patient's blood on the second day of the fever, and a rickettsial suspension was prepared from the lung of a mouse inoculated by the intranasal route with spleen suspension. The strain was passed through a series of guineapigs by spleen and vaginal-exudate suspensions. With lung suspensions of an infected guineapig, micro-agglutination reactions with the patient's serum were positive up to a titre of 1 in 640. Various antisera of fevers of the tick-typhus group obtained from the Rocky Mountain Laboratory, Hamilton, Montana, agglutinated the rickettsiae. With Indian tick typhus the titre was 1 in 640, with a mixed strain of Rocky Mountain spotted fever it was 1 in 160, but the reaction was negative with tick-bite fever. With antigens from the Rocky Mountain Laboratory the patient's

serum gave the following reactions, (+ + + +); at 1 in 80 to 1 in 160 for Rocky Mountain spotted fever; at 1 in 80 for Indian "tick fever" [presumably tick typhus]; at 1 in 10 for tick-bite fever; and at 1 in 160 for North Queensland tick fever. The reactions with antigens of historic and murine typhus and of Q fever were negative.

From *Ornithodorus moubata* fed on the patient the strain was recovered after 60 days but could not be recovered 6 months later.

John W. D. Megaw

PRICE, W. H. **A Quantitative Analysis of the Factors involved in the Variations in Virulence of Rickettsiae.** *Science.* 1953, July 10, v. 118, 49–52. [10 refs.]

The authors describe a large series of experiments whose object was to find the factors concerned in causing the great variations that are known to occur in the virulence of different strains of *Rickettsia rickettsi* recovered from ticks. Four strains of widely different virulence for guineapigs were isolated by yolk-sac culture and tested by intraperitoneal inoculation into groups of 20 guineapigs. Each animal received 1,000 infecting doses (LD50) of a suspension of the strain under test. The number of rickettsiae in each suspension was counted with the help of the electron microscope; the infecting dose for guineapigs was estimated by finding the amount of suspension needed to cause a complement-fixation reaction in an inoculated animal. The infecting dose for embryonated eggs was taken as being the smallest that gave positive smears after two blind passages through the embryos.

Tested on guineapigs the most virulent strain caused severe scrotal reactions in all the animals, with fever lasting about 8 days on the average and the death of 12 of the 20 animals. The strain next in virulence caused moderate scrotal reactions, 4·1 days' fever and no deaths. Next came a strain which caused no scrotal reaction but only fever lasting about the same time as with the preceding strain. The least virulent strain caused no sign of illness. All the 4 strains were alike in respect of the number of rickettsiae needed to infect eggs (1–10); to infect guineapigs (50–200); and to kill 50 per cent. of inoculated eggs (50–200).

All the strains produced an equal amount of toxin, lethal by intravenous injection into guineapigs and neutralized by homologous antiserum. This toxin resembled the one described as being produced by *Rickettsia prowazeki.*

By egg tritation it was found that suspensions of strains of very low virulence needed to kill the embryos contained as many rickettsiae as those made from virulent strains, but differed in multiplying very poorly in guineapigs. No change in the virulence of the strains was caused by passing them through different species of ticks, but a highly virulent strain became attenuated by repeated spleen passage through cottontail rabbits, and then after several passages in the same way through guineapigs its virulence was restored.

Other experiments showed that the virulence of some strains could be increased by a single passage through man. Reactivation of infection in ticks has been thought by some workers to be a process of multiplication of rickettsiae which originally were only enough to immunize but not to cause infection; this view was found untenable because suspensions of ticks which had been infected with a highly virulent strain and stored for 5 months at 6·0°C. were found to contain 1,000 LD50 for eggs per 0·5 ml., yet 16 of 20 guineapigs inoculated with these suspensions remained normal and the other 4 had only slight fever lasting 2 days. Reactivation by keeping these ticks at 37°C. for 48 hours, or by an egg passage, restored a high degree of virulence

to the attenuated strains. It was found that strains which were naturally of low virulence did not acquire any increase in virulence by egg passage or by giving a blood meal to the infected ticks.

[Details of the experiments and of the discussion must be sought in the paper.] *John W. D. Megaw*

Badiali, C. & Zoli, A. Ricerche sulla febbre " Q " in Emilia-Romagna. Primi rilievi epidemiologici in Provincia di Ravenna. [**Q Fever Research in Emilia-Romagna. First Epidemiological Findings in the Province of Ravenna**] (Nota II.) *Riv. Italiana d'Igiene.* 1953, Mar.–Apr., v. 13, Nos. 3/4, 89–95. English summary.

In the Province of Ravenna only a few isolated cases or family outbreaks of Q fever have hitherto been reported. In the present enquiry complement-fixation tests were made with antigens of *Rickettsia burneti* of the Henzerling and Nine-Mile strains. Only negligible differences were observed between the titres of the reactions with the 2 strains.

The tests were made in 3 towns of Ravenna. Among 69 street cleaners 7 gave positive reactions at 1 in 8 to 1 in 64; among 44 workers in slaughter houses 10 reacted at 1 in 8 to 1 in 128; and among 328 unselected healthy persons only 13 reacted at 1 in 8 or 1 in 16.

No evidence was found of the previous occurrence of attacks among the reactors so it seemed likely that the disease ordinarily occurred in inapparent form. *John W. D. Megaw*

Gelfand, M. & Berney, B. **Q Fever in Southern Rhodesia.** *J. Trop. Med. & Hyg.* 1953, Aug., v. 56, No. 8, 184–6. [26 refs.]

The authors, from Southern Rhodesia, give a short account of the history and differentiation of the typhus group of fevers and of Q fever in particular, together with a brief statement of some salient clinical and epidemiological features of the latter disease.

They then give case histories of 2 cases encountered by them in Southern Rhodesia. The first was in a European male dispenser who had a high fever for 16 days: on the 12th day, the Q fever complement-fixation test gave a titre of 1 in 6·25 and a fortnight later, during convalesence, it rose to 1 in 50.

The African patient, an adult male, suffered from an acute respiratory illness suspected of being early pneumonia and acute bronchitis. After 3 weeks, the Q fever complement-fixation test gave a titre of 1 in 50.

The authors point out the need for frequent consideration of Q fever in differential diagnosis, especially in cases with abrupt onset, with fever for more than 6 days, shivering or rigors, sweating and a disproportionately slow pulse-rate. *H. J. O'D. Burke-Gaffney*

Visco, G. Il comportamento di alcuni processi immunitari nel topino inoculato con *Coxiella burnetii* e trattato con cloramfenicolo. [**The Development of Immunity in Mice inoculated with** *Coxiella* (*Rickettsia*) *burneti* **and treated with Chloramphenicol**] *Nuovi Ann. d'Igiene e Microbiol.* 1953, Jan.–Feb., v. 4, No. 1, 34–44. [64 refs.] English summary.

Mice treated with chloramphenicol after inoculation with living or killed rickettsiae of Q fever developed complement-fixing and immunizing anti-

bodies to the same degree as mice left untreated after receiving the same doses of the organisms. *John W. D. Megaw*

RABIES

Remlinger, P., Bailly, J. & Hadji, A. Contribution à l'étude du virus rabique Flury. [**Studies on the Flury Strain of Rabies Virus**] *Bull. Acad. Nat. Méd.* 1953, v. 137, Nos. 21, 22 & 23, 340–42.

The authors have had an opportunity of studying some properties of the Flury virus. In dogs it differed little from fixed virus, producing abortive manifestations and recovery. Rabbits showed little or no susceptibility and the characteristic feature in them was the development of violent epileptiform attacks of short duration, but almost always followed by recovery.

Guineapigs and cats, on the other hand, were very susceptible and in them the paralytic form was common. White rats and mice were also susceptible. Ducks [this *Bulletin*, 1953, v. 50, 404] and geese were susceptible, the latter showing the abortive forms seen in hens and pigeons.

A very striking feature of the Flury virus was the complete absence of Negri bodies in any of the animals or the parts of the brain examined, although signs of encephalitis were marked.

The authors speculate on the immunological questions relating to the Flury virus. They are studying cross-immunity and will report their results. *H. J. O'D. Burke-Gaffney*

Donatien, A., Poul, J. & Rampon, R. Variation de la virulence du virus rabique fixe pour le chien inoculé par la voie intracérébrale. [**Variation in the Virulence of Fixed Rabies Vaccine in Dogs Inoculated by the Intracerebral Route**] *Arch. Inst. Pasteur d'Algérie.* 1953, June, v. 31, No. 2, 102–5.

In connexion with tests designed to measure the protection of dogs by different rabies vaccines, the authors, in Algeria, carried out virulence tests with the "Tangier" strain which is used in preparing the formolized vaccine.

Five tests were done on groups of 25 dogs each during the months of January to July, 1952. The technique is described in detail and the results set out in tables, from which it is apparent that there was considerable variation in the virulence of this strain throughout the year. Reasons are given why technical faults and personal factors might be excluded.

The authors therefore stress the need for regular titration of the virus in control animals identical with those vaccinated and subjected to measurement of protection. *H. J. O'D. Burke-Gaffney*

D'Silva, C. B. **Studies on Rabies. VIII. Observations on Recovery from Rabies, Prolonged Illness in Rabies and Neuro-Sterilization.** *Indian J. Med. Res.* 1952, July, v. 40, No. 3, 317–25.

In this paper the author reports two guineapigs which recovered from rabies, after receiving anti-rabies treatment. A piece of brain removed from

one animal 11 days after onset of symptoms yielded rabies virus on 2nd passage in mice, but no virus was recovered from the brain removed after death 32 days later. The second guineapig's brain yielded no virus as judged by a single mouse passage 10 days after onset of symptoms; the animal was still alive when the paper was prepared. These two animals are offered as evidence that the brain of the treated guineapig can free itself from rabies virus after infection.

The author analyses his experience with 64 guineapigs inoculated with street virus; he found that the duration of illness varied directly with the length of the incubation period.

Three cases of experimentally induced rabies of long duration in the guineapig are recorded. *E. T. C. Spooner*

BÉQUIGNON, R. & VIALAT, C. Contrôle des vaccins antirabiques par épreuve sur le lapin. [**Control of Rabies Vaccine by Tests on Rabbits**] *Ann. Inst. Pasteur.* 1953, Mar., v. 84, No. 3, 529–31.

This article describes how the antirabies vaccine prepared from phenolized sheep's brains for use in human beings is tested in rabbits. Since April, 1952, this vaccine has been used in the Pasteur Institute in place of that prepared from dried cords and the rabbit is used in place of the mouse for determining immunizing power.

For the very detailed technique described, the original paper should be consulted.

PLAGUE

BONNET, D. D. & GROSS, B. **Susceptibility of** *Rattus hawaiiensis* **Stone to Warfarin.** *Science.* 1953, July 10, v. 118, 44–5.

The authors and others have already described the results of tests of Warfarin-treated oats, a commercial anti-coagulant rodenticide [see this *Bulletin*, 1952, v. 49, 509, 510]. The composition of the bait is: Warfarin, 0·025 per cent.; white mineral oil, 11·0 per cent.; p-nitrophenol, 0·25 per cent. (a mould deterrent); and rolled oats, 88·73 per cent. The present experiments confirm the relatively high resistance to the poison among the rats *Rattus hawaiiensis* as compared with other rodents. In the tests now reported 20 *R. hawaiiensis* and 10 *R. norvegicus* were kept in separate cages and were given the poison bait on alternate days, the bait being withdrawn on the other days and replaced by plain rolled oats. All the latter rats died in 4 to 11 days, but only 5 of the 20 *R. hawaiiensis* rats died before the end of 34 days when the 15 survivors were put on a diet consisting only of poison bait, and all of them died after a further average period of 13·5 days. In previous cage tests 42 *R. hawaiiensis* were fed on the same poison bait continuously from the beginning of the test and all of them died after an average period of 7·9 days. The longer survival of the rats previously fed on sublethal doses of the poison may have been due to loss of appetite resulting from their depressed state of health. *John W. D. Megaw*

CHOLERA

CARRÈRE, L. & ROUX, J. Apparition spontanée, persistante, de corps globuleux et de formes L, à partir d'une souche de vibrion cholérique. [**Spontaneous Appearance and Persistence of Globular Bodies and L Forms in a Strain of V. Cholerae**] *Ann. Inst. Pasteur.* 1953, May, v. 84, No. 5, 956–8.

An Inaba strain of *V. cholerae* which had been maintained in the laboratory was found to produce in ordinary nutrient broth a growth which showed numerous globular bodies and L forms. At the seventh sub-passage these predominated over the vibrio forms. The development of the L forms was studied by various methods of culture and examination.

In nutrient broth or peptone water at the fourth hour of incubation the elements present included short forms (1μ), longer forms (10 to 20μ), cocco-bacilli and others, but only very few typical motile vibrios: Gram's stain was retained in varying degree by some of the elements. On continued incubation globular forms appeared in increasing numbers and these were shown to produce either L forms or vibrios of normal appearance. After 3 days' incubation at 37°C. often only L forms, granules or rare vibrios were present in the culture. Subculture on nutrient agar between the 4th hour and the 3rd day showed a very pleomorphic growth. On Dieudonné medium two types of colony appeared: (a) a relatively small number composed of typical Gram-negative motile vibrios, and (b) a majority showing the pleomorphic elements. Subculture of the latter type of colony in broth showed the cycle of development of the L forms while the former produced only vibrios by the third day. By the 4th day, however, the globular forms appeared, and the L forms eventually developed.

On filtration of a 5-day peptone-water culture through a Chamberland L3 candle, L forms were obtained in pure state. No growth could be obtained from the filtrate when transferred to liquid or solid media, but on semi-solid medium serial transmission was successful, the growth obtained consisting solely of L forms.

The addition of penicillin and human plasma to a young culture of the strain produced rapid and extensive development of globular and L forms, although a large proportion of the organisms were lysed. A similar result was obtained with certain other antibiotics.

Intraperitoneal inoculation of a culture containing globular bodies produced a fibrinous exudate in guineapigs with strong polynuclear reaction, but no growth was obtained from the exudate when inoculated on nutrient agar or peptone water. Intraperitoneal, subcutaneous or intradermal inoculation of material containing the globular bodies killed white mice in 24 hours, but the L bodies had no effect.

The nature and significance of the development of the globular bodies and L forms are discussed and the question is raised whether they represent mutation or selection.

It is suggested that the globular forms may represent a resistant phase of the organism. *J. Taylor*

BURROWS, W. **Studies on Immunity to Asiatic Cholera. VI. Observations on the Relation of Antibody to Effective Immunity to Experimental Enteric Cholera, with a Note on Sulfonamide Therapy.** *J. Infect. Dis.* 1953, Mar.–Apr., v. 92, No. 2, 152–63, 5 figs. [13 refs.]

Certain points in the response to active or passive immunization against cholera were tested in guineapigs, which were submitted to challenge

infection by the intragastric route with a dose of vibrio suspension which produced an asymptomatic infection limited to the lumen of the bowel, it being expected that the immune mechanism operating would be similar to that effective in man. The results were measured by determination of the proportionate number of vibrios excreted in the faeces and correlated with copro-antibody titre.

Active immunization with heterologous antigen. In cross tests with the Inaba strain NIH 35 and the Ogawa strain NIH 41 when the challenge was made by either the heterologous or the homologous antigen 4 days after the last dose of vaccine, the peak point of immune response as measured by faecal antibody titre, cross protection appeared to be complete in that the pattern of suppression of infection did not appear to differ appreciably. Similar experiments were also carried out with the non-cholera strain Nanking 32/121 and the Ogawa strain NIH 41 which were unrelated in their O antigens but had a common heat-labile fraction. The Nanking strain was selected for the purpose as having relatively high virulence for mice by the mucin test: in addition hyperimmune serum prepared against the strain had been found by the mouse protection test to give a protective titre of about 17,000 against NIH 41 challenge as compared with 66,000 for the homologous serum for NIH 41: " this was part of the evidence supporting the conclusion that cross protection is demonstrable by the mouse test in the absence of agglutinogens common to the immunizing and challenge strains ".

A partial cross protection, similar to that demonstrable by the mouse test, occurred between these vibrio strains which had no common O agglutinogens. No difference in results was obtained with H-O antigen, as compared with O antigen of Nanking 32/121, the common H fraction playing no part in modifying the infection.

Active immunization with homologous endotoxin. Immunization with a purified endotoxin prepared by alcohol extraction and subsequent acetone precipitation of the strain NIH 41, with subsequent intragastric challenge of guineapigs with the same strain, resulted in an immunity which was inferior to that produced by the intact antigen. Faecal agglutinin titres were similar to that produced by the O antigen, but the pattern of excretion of the vibrio differed. The proportionate numbers of vibrios excreted in the first 3 days did not differ significantly from those observed in animals immunized with the intact O antigen, but vibrio excretion persisted, eventually increasing by the 7th day and continuing for 18 days as in unimmunized controls.

Passive immunization. Parenteral inoculation of guineapigs with antiserum had been found to produce relatively high titre in faecal extracts in 24 hours. A series of doses of serum were given to guineapigs, the first before infection and subsequent doses after intragastric infection. Little or no antibody was at first found in the faeces, although the dosage given was sufficient to produce appreciable titres in the control animals. A later rise occurred, in part representing an active response to the infection. The intensity and duration of infection appeared to be reduced, but passive immunity was not as effective as active immunity.

Chemotherapy. The antibacterial effect of 4 sulphonamides was tested by their intragastric administration in guineapigs before and after infection with *V. cholerae*. Of the compounds used, sulphadiazine and sulphaguanidine were the most effective. Their administration reduced the total

number of organisms in the faeces and differentially affected the cholera vibrio, the duration of the infection being shortened. Sulphathiazole had less effect, and sodium sulphadiazine practically none.

In discussing the results of these observations on immunity to enteric infection of the guineapig with the cholera vibrio, the opinion is expressed that protective antibody titre as determined by the mouse test, or antibody titre as measured by *in vitro* methods such as agglutination, are not necessarily a measure of effective immunity to challenge by the intragastric route. It would appear that the immunity is antibacterial and if on an antibody basis the antibody concerned would be copro-antibody. The vibriocidal action may require the presence of complement. *J. Taylor*

Burrows, W. & Ware, L. L. **Studies on Immunity to Asiatic Cholera. VII. Prophylactic Immunity to Experimental Enteric Cholera.** *J. Infect. Dis.* 1953, Mar.–Apr., v. 92, No. 2, 164–74, 6 figs.

The response of guineapigs to active immunization with cholera vaccine was measured by the increase of the intragastric dose of *V. cholerae* required to produce infection. (An animal was considered to be infected if at any time during the period of observation, not less than one week and 4 successive specimens, detectable numbers of vibrios were excreted.) The infecting dose (ID50) was first determined for unimmunized animals on dry weight of vibrios, the level being found to be 0·08 mgm. with a standard deviation of 0·02 mgm. Copro-antibody titre response to a dose of 1·0 mgm. was appreciable and 5th day titres ranged from 1:10 to 1:50. In guineapigs immunized with cholera O vaccine and infected intragastrically 4 days after the last inoculation the ID50 dose rose to 1·13 mgm. at the height of the immune response, a 14-fold increase over that for normal animals. The level declined to 8·7-fold at the 14th day and 1·9-fold at the 28th day.

Passive immunization by intraperitoneal injection of hyperimmune serum resulted in only a 2·5-fold increase in spite of the presence of a good titre of copro-antibody. The immunity was markedly inferior to that produced by active immunization. No immunity was shown when the infecting dose was given 14 days after parenteral inoculation of the antiserum. It had been found in previous work that when antibody is introduced by the intragastric route much is absorbed and appears in the serum 10 to 14 days later, and some may then be found in the faeces [this *Bulletin*, 1948, v. 45, 898]. When guineapigs were infected 24 hours after intragastric immunization with hyperimmune rabbit serum there was an immediate 4-fold increase in the ID50 dose as compared with the normal. At a second titration 14 days after the administration of the serum the increase was found to be 6-fold. This increase was coincident with excretion of antibody originally absorbed from the bowel. It is suggested that copro-antibody plays a significant part in prophylactic immunity to cholera. *J. Taylor*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

EYLES, D. E., JONES, Frances E. & SMITH, C. S. **A Study of *Endamoeba histolytica* and other Intestinal Parasites in a Rural West Tennessee Community.** *Amer. J. Trop. Med. & Hyg.* 1953, Mar., v. 2, No. 2, 173–90, 2 figs. [11 refs.]

In this paper are reported the results of an epidemiological survey of the prevalence of intestinal parasites in a rural community situated in the southern part of Fayette County in West Tennessee. The incidence of infection is correlated with the environmental and economic conditions of the inhabitants, with special reference to households as units. The findings are also analysed in the light of existing hypotheses regarding the transmission of the parasites.

In most cases 3 specimens of stools were examined in direct smears or after concentration by the zinc sulphate flotation technique, from a total of 2,657 persons belonging to 532 households, of whom 90 per cent. were Negroes. The incidence of protozoa (cysts) per cent. was as follows (figures in brackets refer to familial rates): *Entamoeba histolytica* 10·5 (30·6) (large and small races in almost equal proportions), *E. coli* 22·2 (54·3), *Endolimax nana* 29·1 (66·2), *Iodamoeba* 3·9 (11·3), *Giardia* 9·0 (27·2), *Chilomastix* 0·6 (2·3). The actual incidence of protozoa was estimated to be half as high again as the observed rates. In spite of the higher standard of living of the White race, there was no significant difference between the incidence of infection among the White and Negro populations. In general, the incidence of amoebic infections was higher in adult females than in males. As regards age differences, *E. histolytica*, *E. coli* and *Iodamoeba* were more common in the 10–14-year age group, while the incidence of *E. nana* was high in all groups over 10 years, but especially in persons over 60 years old. *Giardia* was more prevalent in the 5–9-year age group.

The incidence of helminthic infections per cent. was as follows (familial rates in brackets): *Ascaris lumbricoides* 4·3 (11·6), *Hymenolepis nana* 0·8 (2·6), and isolated cases of *Necator americanus*, *Trichuris trichiura* and *Hymenolepis diminuta*.

The prevalence of amoebae was found to be correlated with the standard of sanitation in the houses and personal cleanliness of its inhabitants, but pollution of water supply was not associated with increased incidence of amoebic infection. The findings point to transmission by contact with infected persons or articles contaminated by them. *C. A. Hoare*

MICHAELSON, J. B., DELAMATER, J. N. & TALPIS, Lottie. **Comparison of Starches used in the Culture of *Endamoeba histolytica*.** *Amer. J. Trop. Med. & Hyg.* 1953, Mar., v. 2, No. 2, 219–26. [40 refs.]

Since 1926, when DOBELL and LAIDLAW discovered that growth of *Entamoeba histolytica* in culture was considerably improved by addition to the medium of rice starch, the latter became a necessary component of the liquid phase of most media. The authors have compared the relative growth-promoting properties of rice starch and rice powder, and found that the latter produced almost twice as many trophozoites, when added in 50 mgm. amounts to a medium consisting of a filtrate of heat-coagulated serum. In order to elucidate further the factors responsible for these differences, the 2 substances were subjected to detailed quantitative analysis; (a) finely ground rice starch, and (b) Bacto rice powder or flour

were used. Rice powder was found to contain a higher concentration of readily water-soluble carbohydrate, about 7 times more total lipid and fatty acids, and 5–6 times more nitrogen than the starch. It also proved to be a richer source of water- and fat-soluble vitamins, and possessed a higher inorganic content than the starch. *C. A. Hoare*

PHILLIPS, B. P. **The Effects of Various Treatment Procedures on the Metabolism of** *Trypanosoma cruzi* **and on its Ability to support Growth of** *Endamoeba histolytica.* *Amer. J. Trop. Med. & Hyg.* 1953, Jan., v. 2, No. 1, 47–53. [13 refs.]

It is generally accepted that the growth of *Entamoeba histolytica* in culture depends upon the presence of products of metabolism of the accompanying micro-organisms. The present paper describes the results of experiments devised to study the factors in question in the case of amoebae cultivated with *Trypanosoma cruzi.*

The basic medium AT—which is used for cultivating the amoeba-trypanosome complex—consisted of 4 parts trypticase-serum and 1 part saline-sodium thioglycollate solution. In the experiments the trypanosome component was subjected to the following treatments: (1) the trypanosomes were removed by centrifugation, and the cell-free supernatant fluid was used; (2) they were filtered through Berkefeld filters; (3) homogenates of the trypanosomes, produced by breaking them up with an electro-magnetic vibrator, were used; (4) a dialysate was obtained by growing the trypanosomes in cellophane tubing; (5) the trypanosomes were used after inactivation by heat at 48°C.; (6) they were also used after exposure to freezing (at −10°C.) and subsequent thawing (at 37°C.); (7) they were dried in a desiccator jar, (8) exposed to distilled water, (9) N/25 HC1, and (10) ether. The amoebae were added to the 10 treated media, and their growth was compared with that of amoebae cultivated with untreated *T. cruzi.* In the course of these studies the metabolic activities of the treated trypanosomes were assessed by measurements of oxygen uptake, by reduction of methylene blue, and changes in the *p*H of the medium.

Abundant growth of amoebae was obtained in cultures with untreated trypanosomes, while some growth was observed with heat-treated trypanosomes, but in media containing inactivated trypanosomes, or filtrates, supernatant fluid and dialysates of trypanosome cultures, the amoebae failed to survive beyond the second subculture. It was thus demonstrated again that the growth of *E. histolytica* is adversely affected when the metabolic activity of the micro-organism associated with it in culture is inhibited. *C. A. Hoare*

LAARMAN, J. De oorsprong van de vloeistof van Bayer voor het concentreren van amoebecysten in de ontlasting. [**The Origin of Bayer's Fluid Used in Concentrating Amoebic Cysts in the Stools**] *Nederl. Tijdschr. v. Geneesk.* 1953, Feb. 28, v. 97 (i), No. 9, 538–9. [11 refs.] English summary (3 lines).

In a previous paper [this *Bulletin*, 1952, v. 49, 953] the author described Schüffner's modification of Bayer's method for concentrating amoebic cysts from faeces. The present paper gives a short historical review of the various changes introduced in the composition of Bayer's fluid by various workers. *C. A. Hoare*

WEISER, N. J., SPIOTTA, E. & EKMAN, P. **Experiences in the Diagnosis and Antibiotic Therapy of Amebiasis: an Analysis of 50 Cases.** *Ann. Intern. Med.* 1953, May, v. 38, No. 5, 1002–26, 6 figs. [61 refs.]

Fifty patients, most of them soldiers returned from the Far East, all suffering from amoebiasis, were closely studied. The diagnosis was established by stool examinations, many accepted techniques being used, and by sigmoidoscopy. Sigmoidoscopic examination was found to be " vastly superior to careful stool examination in the diagnosis of the disease ". This statement is amplified in a table showing that whereas in 34 of 39 patients with amoebiasis the diagnosis was made by sigmoidoscopy, in only 9 of the 39 were parasites identified in the stools [these findings are in remarkable contrast to those of nearly every other worker on record in this field]. Consequently the authors consider that examination of the mucosal aspirate obtained sigmoidoscopically is an essential in determining the presence or absence of intestinal amoebiasis. They enlarge on the sigmoidoscopic appearances they observed in their cases of amoebiasis, and the manner in which they consider that these arise; they similarly deal with hepatic involvement, which they consider to be very common though likely to be missed by " the investigator who is not alert to the nonspecific and low grade signs of hepatic amebiasis ". They subscribe to D'ANTONI's views [see this *Bulletin*, 1952, v. 49, 692] on the symptom complexes encountered in amoebiasis, and describe some illustrative cases. The patients were treated with terramycin, aureomycin, chloroquine and emetine in various combinations with disappointing results both in obtaining cure, and in so far as toxic side effects were concerned. From their own experience the authors, among other statements, write " that it is no more possible to state that the *E. histolytica* has been eradicated from the tissues of the host than it is to state that the tubercle bacillus has been eradicated from the tuberculous patient, no matter how careful the search for residual infection ".

[The voluminous citation of literature is almost exclusively American in origin; the opinions expressed are not likely to find wide acceptance among workers elsewhere; the findings, in the opinion of the abstracter, are open to question.] *A. R. D. Adams*

CHAKRAVARTI, A. **Pulmonary Amoebiasis (with particular reference to Chloroquine Therapy).** *J Indian Med. Ass.* 1953, July, v. 22, No. 10, 418–22, 4 figs. on pl.

The author has already [this *Bulletin*, 1951, v. 48, 1108; and 1952, v. 49, 955] reported on 18 cases of pulmonary amoebiasis seen in India. He now records the findings in yet another 8 similar cases. The details of the salient clinical features, of the laboratory examinations, and of the results of treatment as judged by the radiologically evident changes in the chest are set out in 3 tables. In each case the lesions were in the right lower zones, usually in association with a tender liver enlargement. The chief symptom was pain in the right side of the chest; in 2 cases there was haemoptysis. Radiologically there was a filmy pneumonic opacity in the lowest lobe of the right lung, which was triangular in shape, often closely situated to the diaphragm and sometimes tailing up to the hilum. Parasites were not recovered from the sputum in any of these 8 patients.

Chloroquine, either alone or in conjunction with emetine, gave a prompt therapeutic response in the 5 cases in which it was employed; the remaining 3 cleared up with the usual emetine treatment.

A. R. D. Adams

PURANDARE, N. M. **Intussusception Due to Amebic Colitis. A Case Report.** *Indian J. Med. Sci.* 1953, June, v. 7, No. 6, 288–90, 3 figs. (2 on pl.).

A patient, aged 35 years, was admitted to hospital for rectal bleeding and abdominal pain. Three days later he developed a lump on the right side of the abdomen with apparent emptiness of the right iliac fossa. Laparotomy was performed and an intussusception extending to the middle of the transverse colon was found. It was only partially reducible, so hemicolectomy with ileo-colostomy was carried out. The patient died 34 days later. At autopsy ulcers were found in the colon, scrapings from which showed *E. histolytica*. A liver abscess, which had ruptured into the subdiaphragmatic region, was present and scrapings from its wall showed *E. histolytica*.

There were 339 autopsies during the past 27 years in the Pathological Department of the S.G.S. Medical College, Parel, at which an autopsy diagnosis of amoebic colitis was made; this was the only example of intussusception as a complication of amoebic colitis. *W. L. Harnett*

CHARMOT, G., LE HENAND, F. & GIUDICELLI, P. Note sur le traitement de l'ambiase intestinale aiguë en A.O.F. par le bis (p. arsonophénylamino) 1, 2 éthane. [**Treatment of Acute Intestinal Amoebiasis in French West Africa with bis-(p-arsonophenylamino), 1, 2, ethane (4763 R.P.)**] *Med. Trop.* Marseilles. 1953, Mar.–Apr., v. 13, No. 2, 207–9.

Thirty-three patients (22 Europeans and 11 Africans) with acute intestinal amoebiasis have been treated with "bis(p-arsonophenylamino), 1, 2 ethane" [4763 R.P., French trade name *Bémarsal*, approved name *diaphétarsine*]. The dose was 2 gm. daily for 10 days. Stools were examined daily throughout the treatment; 3 weeks later they were re-examined, and the patients were given a repetition of the course of treatment. In all but one case the immediate result of treatment was good; only this single patient showed no betterment as a result of it, and indeed he developed hepatic amoebiasis during it. Twenty-three of the patients were re-examined 2 months later; 4 (18 per cent.) of them had relapsed parasitically by this time. This compound by itself, therefore, although it produces a high proportion of immediate satisfactory clinical responses, like the other recognized amoebicidal drugs does not consistently eradicate the infection. Further treatment by repetition of the course, or with other drugs, should follow it. *A. R. D. Adams*

TUCKER, W. H. **Treatment and Prognosis of Amebiasis.** *J. Med. Ass. State Alabama.* 1953, Mar., v. 22, No. 9, 231–5.

The author subscribes to the view that amoebiasis is rarely asymptomatic, and that it gives rise to a wide range of symptoms often completely unrelated to the gastro-intestinal tract. All diagnosed cases should therefore be given anti-amoebic treatment; that advocated is the simultaneous administration of Milibis, chloroquine, and oxytetracycline (terramycin). Though not more than 70 per cent. of mildly symptomatic patients will be relieved of their symptoms by such specific treatment, its use is justified by the consequent reduction in the number of carriers of the infection who constitute a danger to themselves and to their fellows. *A. R. D. Adams*

EL-BADRY, A. **Treatment of Amoebic Hepatitis and Amoebic Liver Abscess with Aureomycin.** *J. Roy. Egyptian Med. Ass.* 1953, v. 36, No. 4, 327–34.

Six patients believed to be suffering from amoebic hepatitis or amoebic liver abscess were treated with aureomycin, emetine treatment for various reasons being discontinued or being considered undesirable. All were considered to be cured of the condition by it. Aureomycin is consequently considered to be a promising drug in the treatment of amoebic hepatitis and non-infected amoebic liver abscess. *A. R. D. Adams*

BATTERSBY, A. R., OPENSHAW, H. T. & WOOD, H. C. S. **The Synthesis of Emetine and Related Compounds. Part II. The Synthesis of (±)-Rubremetinium Bromide.** *J. Chem. Soc.* 1953, Aug., 2463–70, 1 fig.

ISHII, Y. **On the Influences of Constipation upon the Experimental Infection of** *Entamoeba histolytica* **in Rats.** *Kitasato Arch. Exper. Med.* 1952, Oct., v. 25, No. 2, 141–7.

Experiments were carried out on rats experimentally infected with *Entamoeba histolytica*, with the object of studying the effect of induced diarrhoea and constipation on the infection.

In one batch of rats $MgSO_4$ was mixed with the food to produce diarrhoea. Out of a total of 32 rats, only 3 were successfully infected—in one case with amoebic ulceration of the caecum, while among 36 control rats infection established itself in 14, in 3 of them with ulceration.

In another batch of 60 rats constipation was produced by ligaturing the anus, and 48 hours later the amoebae were inoculated *per os* in the form of cysts, and *per anum* with trophozoites. In those rats which were inoculated by mouth the resulting infection did not differ from that in the control rats, but in those inoculated rectally both the infection rate (42 per cent.) and degree of ulceration (42·9 per cent.) were markedly higher than in the control animals (19·6 and 20 per cent. respectively). In the experimental rats the ulcers were formed in the rectum within the walls expanded as the result of constipation, whereas in the control animals they were restricted to the caecum. *C. A. Hoare*

YAMAGISHI, Y. **On the Encystation of** *Entamoeba muris* **in the Host.** *Kitasato Arch. Exper. Med.* 1952, Oct., v. 25, No. 2, 133–9, 2 figs.

As in other intestinal amoebae, the discharge of cysts of the murine parasite, *Entamoeba muris*, occurs at irregular intervals, but nothing is known regarding the factors governing encystation. In the present paper an account is given of the effect of induced diarrhoea on cyst-production in experimentally infected rats. Each rat was kept in a separate wire cage, at the bottom of which was placed moist filter paper from which the droppings were collected every 24 hours, emulsified in a counting tube and counted by Stoll's method.

In untreated rats examined daily for one month the cysts were discharged very irregularly and without any periodicity, from zero on some days to up to 9,000 on others. Another batch of infected rats were fed on dumplings of flour kneaded with saturated $MgSO_4$ solution in order to induce diarrhoea, which usually lasted one day. For several days afterwards the cysts disappeared, but after the negative period some of the rats discharged

abundant cysts, with a daily output of 1,760 to 18,300, while in other rats the discharge continued to be irregular. Attempts to assess the effect of other factors—such as *p*H and amount of water in the caecal contents—did not produce satisfactory results.

The diarrhoea appeared to promote an increase in the number of trophozoites and a correspondingly abundant discharge of cysts, but the absence of this effect in some of the rats seemed to indicate that this was not the only factor involved. Encystation of *E. muris* appears to take place mainly in the colon, at the expense of trophozoites and precystic forms emerging from the caecum, while the rectum contained only cysts.

C. A. Hoare

BOUGHTON, C. R. & BEARUP, A. J. **A Case of Infection with** *Dientamoeba fragilis*. *Med. J. Australia.* 1953, May 30, v. 1, No. 22, 779–80.

"A case of infection with *Dientamoeba fragilis* is reported. No evidence was obtained that any of the symptoms were related to the presence of this amoeba.

"Details are given of methods for the identification of *D. fragilis* in stools."

[See also this *Bulletin*, 1945, v. 42, 386.]

BIAGIF F., F. Indices coproparasitoscópicos humanos en Escárcega, Camp. [**Intestinal Parasites in a Small Community in Campeche, Mexico**] *Medicina.* Mexico. 1953, May 25, v. 33, No. 676, 217–20, 2 figs.

The only unusual case was one of infection with *Isospora hominis*.

VAN STEENIS, P. B. **Giardiasis.** *Nederl. Tijdschr. v. Geneesk.* 1953, July 18, v. 97 (iii), No. 29, 1886–92.

In 3,289 patients who had returned from the tropics and who were especially examined for giardiasis on 1 to 3 occasions, in 61 (1·9 per cent.) were these parasites demonstrated. Clinical manifestations were carefully sought for, but none of any severity was forthcoming.

On 23 occasions a symptom-complex was encountered, with abdominal pain, epigastric distress and distension. In 14 there was diarrhoea, in 5 constipation and once only was the liver palpable; 18 patients had no complaints. Anaemia, when present, was not severe and 60 per cent. haemoglobin was the lowest recorded.

The idea that *Giardia* is pathogenic is mainly based on the grounds that mepacrine therapy abolishes the parasites from the faeces, and such clinical symptoms as might have been present disappear. Moreover, the localization of *Giardia* in the duodenum and its banishment from that area may be regarded as a physiological reason for the clearing-up of symptoms. Mepacrine in three daily doses of 100 mgm. for 5 days effected a cure in 59 out of 61 in one course; the two remaining patients were cured with a second of the same intensity and duration.

Philip Manson-Bahr

RELAPSING FEVER AND OTHER SPIROCHAETOSES

THEODOULOU, M. **Tick-Borne Relapsing Fever in Cyprus.** *Cyprus Med. J.* 1952, June–July, v. 5, Nos. 8/9, 860–62, 2 figs.

This is a short note on 10 cases of relapsing fever in labourers engaged in excavating earth for road paving near Larnaca, at a place where there were a few burrows and small caves. The men fell ill 15–17 days after exposure, and they gave a history of having been bitten by small ticks. The disease was diagnosed microscopically, and was mild, and reacted to treatment with neoarsphenamine or antibiotics.

To avoid spreading infection the quarry was treated with 5 per cent. DDT, as were the village houses and the excavated earth spread on the roads. The tick which transmits relapsing fever in Cyprus is *Ornithodorus tholozani*, which haunts burrows, caves, old buildings, etc. [See also this *Bulletin*, 1949, v. 46, 470.] *Charles Wilcocks*

GEFEL, A. & RUBENOW, R. [**Terramycin in the Treatment of Relapsing Fever**] *Harefuah.* Jerusalem. 1953, June 15, v. 44, No. 12, [in Hebrew 263–5. (16 refs.) English summary 265–6.].

The English summary appended to the paper is as follows:—

"(1) Relapsing Fever is prevalent in Israel in its tick-borne type. This form is known to be resistant to arsenicals, penicillin, gold and bismuth compounds.

"(2) Laboratory experiments carried out by Adler *et al.* have proved the specific influence of terramycin on *Spirochaeta persica.* Treated intraperitoneally with 40 mg./kg. terramycin, rats inoculated with *Sp. persica* recovered with no relapses. Given orally, its influence is slower, and larger doses (200 mg./kg. or more) are needed.

"(3) Seven cases of relapsing fever treated with terramycin—2 orally, 4 intravenously and 1 intramuscularly—are reported. Parenteral treatment consisted of 0·5 gms. terramycin daily for five days. A relapse occurred in one case treated orally with 55·5 mg./kg. per diem for five days.

"(4) In all cases treated parenterally, reaction was rapid: the temperature dropped within about 24 hours, clinical signs disappeared gradually, the blood was cleared of parasites within a few hours—in one case within 45 minutes.

"(5) The importance of the blood sedimentation rate in the prognosis of relapsing fever is emphasized. Relapsing occurred in four cases of non-specific treatment in which the B.R.S. did not return to normal levels after the fall of temperature.

"(6) In two of the cases reported, we found acquired haemolytic anaemia caused by the spirochaeta—a complication which has not yet been reported.

"In one case, infarction of the spleen simulating an acute abdomen was the first indication of the disease."

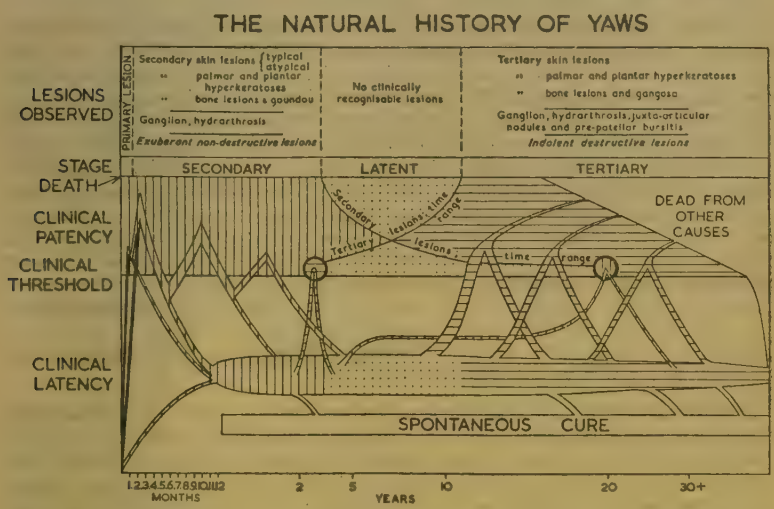
[See also CHARMOT *et al.*, this *Bulletin*, 1953, v. 50, 941.]

YAWS AND OTHER TREPONEMATOSES

HACKETT, C. J. **The Natural History of Yaws.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, July, v. 47, No. 4, 318–20, 1 fig.

In campaigns against yaws it is essential to recognize patients with infectious lesions and those likely to develop infectious lesions, so that, by treatment of both groups, the reservoir of infection will be controlled. It is confusing to find tertiary lesions in children who say that they have had yaws only a few years earlier, and secondary lesions in adults who contracted the disease long ago, in childhood, and it should be realized that plantar and palmar hyperkeratoses can occur in both secondary and tertiary stages.

It is at present impossible to be dogmatic about the development and classification of the stages of yaws, but the author has clarified the position by constructing a diagram (reproduced here) in which the various stages,



their lesions, their latency and their progress, are set out according to time and clinical manifestations. It follows roughly the form of a diagram used by REYNOLDS, F. W. (*Oxford Medicine*, 1948, v. 5, 657) for syphilis, and it will repay study. It shows that secondary lesions can arise very late after years of latency. *Charles Wilcocks*

TAVARES, A. Recentes avanços na terapêutica antipiânica. [**Recent Advances in the Treatment of Yaws**] *Med. Cirurg. Farmacia.* 1952, June, No. 194, 287–94.

This paper describes various experimental schemes used in the Rapid Treatment Centre for Yaws at Borborema in the State of Paraíba, Brazil, in 1950–51. The drugs used were arsenical preparations alone or together with bismuth or other preparations or penicillin in courses lasting 16–54

days. Other antibiotics by themselves were also used. Results are discussed in broad clinical terms. Attention is called, early in the paper, to the favourable results following a single injection of procaine penicillin in aluminium monostearate in doses of 2 to 4 ml. that have been obtained in Haiti although the author has not had such good results. *C. J. Hackett*

LEPROSY

SAGHER, F. **Leprosy.** (A Review of the Literature from Late 1948 to Early 1950.) Reprinted from *Dermatologica.* 1951, v. 103, Nos. 4/5, 286–318. [399 refs.]

DOYLE, J. O. **Case of Leprosy seen in a Venereal Disease Clinic in Britain.** *Brit. Med. J.* 1953, Aug. 1, 261–2, 1 fig.

The case described and the history are of typical lepromatous leprosy. The remarkable feature is the length of time (12th May, 1951 till after 31st July, 1952) that it took to make a diagnosis. The chief stumbling-blocks were the positive serological findings, venereal disease being suspected, and the fact that the patient had not been abroad for 8 years. As late as 31st July, 1952, Professor R. A. Willis of Leeds University expressed the opinion that sections " showed nothing histologically very distinctive, suggesting leprosy as a remote possibility ", and yet " Ziehl-Neelsen-stained sections revealed a profusion of intra-histiocytic acid-alcohol-fast bacilli ". [This and the previous article show the importance of closer acquaintance with tropical diseases, such as leprosy, now that modern travelling facilities have increased our contact with the endemic diseases found in the tropics and subtropics.] *Ernest Muir*

ROGERS, J. & ADAMSON, D. G. **Leprosy: Report on Four Cases.** *Brit. Med. J.* 1953, Aug. 1, 259–60, 2 figs.

The interest of this note consists not in the nature of the 4 cases described, which were apparently similar to the ordinary cases found daily in endemic countries, but in the fact that as many as 4 cases of leprosy should have been found in one clinic in Britain during some 2 or 3 years. The first patient was a Goanese with a single tuberculoid lesion; the second had been in India (as well as Cyprus and Syria) during the second world war, and had the lepromatous type which took nearly 2 years to diagnose; the third, who had seen 30 years' service in India, was of the polyneuritic group and showed no bacilli; the fourth was an Indian and had the lepromatous type. Thus all four patients probably acquired the disease in India. *Ernest Muir*

GONZÁLEZ PRENDES, M. A. & YBARRA PÉREZ, R. Las Antillas: puerta de entrada de la lepra en América. [**The Antilles, the Gate of Entrance of Leprosy to America**] *Rev. Sifilografía, Leprología y Dermatología.* Marianao, Cuba. 1952, July–Dec., v. 8, No. 2, 5–25. [112 refs.]

The authors quote literature of the time of the discovery of America by Columbus to prove that the indigenous inhabitants, who were then chiefly naked, showed no signs of leprosy. The disease was, however, fairly common at that time in the Iberian Peninsula and leprosy was probably first introduced

from there. From 1498 onwards slaves were introduced to the Antilles from W. Africa where leprosy was endemic. Later, Indians were introduced from India, also an endemic country. [A quotation is made from Cochrane saying that there are 300,000 cases of leprosy in Madras alone, and that the total population of Madras is 777,000 inhabitants. This is obviously a mistake due to confusing the *Town* of Madras with the *Province* (now State) of Madras; the latter having a population of many millions.] *Ernest Muir*

Ibarra Pérez, R. & González Prendes, M. A. La lepra en Cuba. [**Leprosy in Cuba**] *Rev. Sifilografia, Leprologia y Dermatologia.* Marianao, Cuba. 1952, July–Dec., v. 8, No. 2, 28–9.

The authors state that in 1946 there were 2,802 known cases of leprosy in Cuba, in 1948 there were 3,001 and that in the census carried out early in 1952, the figure was shown to be 3,623. The increase of 20 per cent. since 1948 is largely attributed to the active measures of case-finding employed in recent years. Of these cases, 2,887 are ambulatory and 736 are in institutions. The population of Cuba at the time of the census was 5·8 million, so that the present incidence of ambulatory cases is about 4·96 per 10,000.

Detailed figures are given for each of the 6 provinces. Oriente accounts for 39·28 per cent. of the cases, Habana for 23·16, Las Villas for 16·67, while the percentages for Camagüey, Matanzas and Pinor del Rio are respectively 12·76, 5·30 and 2·80.

The density of ambulatory cases is 2·5 per 100 sq. km. for the whole country. *H. J. O'D. Burke-Gaffney*

Gomes, J. M. A lepra é um problema internacional. [**Leprosy is an International Problem**] *Rev. Brasileira Leprologia.* S. Paulo. 1953, Mar., v. 21, No. 1, 69–77, 1 map.

A shaded map is given showing the percentages of leprosy patients to the general population in the various countries of South America. In French Guiana there are 25 per thousand, in Dutch Guiana 2, in British Guiana 2·27, in Venezuela 0·75, in Columbia about 2, in Peru 0·28, in Bolivia 0·42, in Paraguay 2, in Argentina 0·61, in Uruguay 0·35 per thousand. In Amazonia there are calculated to be more than 5 per thousand. The author considers that as all these affected countries border on each other the problem is an international one and should come under the purview of the World Health Organization or the Pan-American Sanitary Organization.

Ernest Muir

Bechelli, L. M. Alguns dados epidemiológicos sôbre a situação da campanha antileprosa no Estado de São Paulo. [**Certain Epidemiological Data bearing on the Situation of the Antileprosy Campaign in the State of São Paulo**] *Rev. Brasileira Leprologia.* S. Paulo. 1953, Mar., v. 21, No. 1, 33–42, 5 figs.

The Department of Prophylaxis of Leprosy in São Paulo began in 1926, and between then and 1950, 33,476 patients have been enrolled. At the end of 1950 there were 8,525 patients in leprosaria, and 9,835 under treatment in dispensaries (out of a total population of 9,242,610 inhabitants). There are 5 leprosy dispensaries in the capital and 23 scattered through the interior of the State. The epidemiological observations are as follows:

(1) it appears to the author that in the most affected municipalities the numbers of cases have diminished since the intensification of vigilance on the part of doctors and regional dispensaries; (2) the indices of incidence have diminished over the course of these years; (3) there is still an upward curve in the total number of cases, but they have become more chronic. Reaching the summit of the curve has been delayed by the diminution of deaths caused by the use of sulphones. The curve of prevalence will begin to descend when there is an appreciable fall in the number of new cases (incidence). Study of statistics shows that there is already a slight fall in the endemicity and gravity of the disease.

The author considers that the use of sulphones and BCG, along with an increase in the number of dispensaries and intensity of the control of contacts with negative lepromin tests, should, with the collaboration of health centres, lead to the extinction of leprosy from the state.

Ernest Muir

ROTBERG, A. Fundamentação e proposta de modificação da classificação de tipos de lepra de Havana, apresentando Guia para uso prático. [**The Basis and Proposed Modifications of the Havana Classification of Types of Leprosy**] *Rev. Brasileira Leprologia.* S. Paulo. 1953, Mar., v. 21, No. 1, 16–32. [11 refs.] English summary.

The 3 main modifications suggested are: use of the word "bipolar" in place of "borderline" for those cases which contain elements of the 2 polar types; use of the term "infrapolar" in place of "indeterminate" in cases which clinically cannot be assigned to one or other of the two polar types; in cases with only nerve lesions and no skin lesions the classification would be *tuberculoid* if the lepromin test were definitely positive, and *infrapolar* if it were negative or weak.

The second part of the paper gives a guide to recognition of the classification of types, and further explains the principles under which it is proposed to divide cases. It is suggested that the terms used are simple and will fit into the vocabulary of any language. *Ernest Muir*

CURBELO HERNÁNDEZ, A., GONZÁLEZ PRENDES, M. A. & FORS CARBONELL, A. La baciloscopía fluorescente en la lepra tuberculoide. [**Examination of Tuberculoid Leprosy with the Fluorescence Microscope**] *Rev. Sifilografía, Leprologia y Dermatologia.* Marianao, Cuba. 1952, July–Dec., v. 8, No. 2, 26–7.

Of 90 examinations of skin smears from 30 tuberculoid patients, who had previously been found negative, 25·5 per cent. were found positive for bacilli and 20 per cent. for granules; 50 per cent. of the patients examined were found positive. This method is recommended in conjunction with that of concentration devised by DHARMENDRA and MUKHERJEE [this *Bulletin*, 1953, v. 50, 314]. *Ernest Muir*

ARGÜELLES CASALS, D. Nueva técnica de la prueba de la histamina en la lepra. [**New Technique for the Histamine Test in Leprosy**] *Rev. Sifilografía, Leprologia y Dermatologia.* Marianao, Cuba. 1952, July–Dec., v. 8, No. 2, 30–32. [15 refs.]

The test consists of the "triple effect of Lewis" on injecting histamine into the skin, or introducing it by puncture or scarification. The author,

instead of introducing histamine, produces it locally by pinching the skin of the suspected area with the finger nail, the slight injury causing the formation of histamine. The secondary erythematous reaction does not appear on an area where the cutaneous nerves are affected by the disease; and thus invisible early leprous lesions may be made to show up as white patches in the midst of erythematous healthy skin. The effect may be increased by applying friction to the whole area. *Ernest Muir*

DE SOUZA LIMA, L., SOUZA CAMPOS, N., ROSEMBERG, J. & AUN, J. A. O emprêgo do BCG na dessensibilização da reação leprótica. [**The Use of BCG in Desensitizing to Lepra Reaction**] *Rev. Brasileira Leprologia.* S. Paulo. 1953, Mar., v. 21, No. 1, 59–66.

The authors treated 36 patients subject to attacks of lepra reaction with oral BCG, in weekly doses of 0·20 gm., making a total of 3 gm. in 15 weeks. The patients were divided into 4 groups according to the severity of the reactions. The results were that after a year of observation 8 patients had remained completely free from reaction, in 9 only slight markings remained, in 14 there was marked improvement, with diminution of the elements of erythema nodosum, while in 5 there was no result. In the authors' opinion the results in relieving this condition were much better than those with any other remedies tried, including antihistamines, Cortisone and ACTH.

Ernest Muir

DE FARIA, J. LOPES. **Contribuição ao conhecimento da natureza da reação de Mitsuda.** [A Contribution to the Knowledge of the Mitsuda Reaction] pp. 197 + 54, 98 figs. 1953. Rio de Janeiro: Dept. Imprensa Nacional.

In this contribution an attempt is made to clarify our knowledge of the lepromin or Mitsuda test. This test has become of increasing importance in the last few years, especially since BCG vaccination was found to change a negative into a positive reaction in a large percentage of subjects. The author first reviews the literature regarding the antigen, histopathology and nature of the lepromin reaction, and then discusses the general subjects of allergic inflammation, fibroid degeneration and the chemical composition of acid-fast bacilli. Next he considers the pathological cause of the nodule produced by the injection of the lepromin antigen, and its tuberculoid structure, after which he describes his own experiments.

The first of these was planned to show whether it is the lipoid or the water-soluble (proteins and polysaccharides) fraction of the lepra bacillus that is responsible for the skin reaction. The former was inoculated into the skin of 12 dogs, and the latter into 10 dogs, each being given a number of injections. The water-soluble fraction did not produce either an early (48 hours) or a late (21 to 30 days) reaction, but only a slight fugitive papule or erythema at 24 hours. The lipoid fraction caused a papule averaging 5·1 mm. at 48 hours, which became a nodule and remained till the 21st or 30th day. The histology of this was either diffuse or nodular tuberculoid granuloma, consisting mainly of epithelioid cells and histiocytes, with Langhans and foreign-body giant cells. The reaction was less strong but more rapid than when the whole antigen was injected, which the author explains by the fact that the lipoids were not bound to the bacilli. It is noted that the dogs could not have been specifically sensitized to the lipoid fraction.

In a second series of experiments the Mitsuda test was performed in tuberculoid and lepromatous patients, and the results were examined macroscopically and microscopically at intervals up to 90 days. The results in the tuberculoid cases were similar to those in the dogs, both macroscopically and microscopically as regards the nodule at the site of injection, but the comparative histological study showed a difference in that in the lepromin reaction of the leprous patients there was at first (between 1 and 48 hours) a " hypergic " factor disclosed by its greater intensity, the larger number of eosinophiles in the inflammatory exudate, and the earlier formation of granuloma. Bacilli were found till the 88th day, whereas in the dogs they persisted up to the 35th day only. This, and the quicker evolution of the nodule in the dogs, are explained by " the conspicuous rôle of the neutrophil leucocytes which invaded very soon the granulomas (still developing and young) forming micro-abscesses ".

From this work the author deduces that only the early reaction is allergic in nature, and that the late reaction is independent of antigen-antibody mechanism and is due mainly to the natural resistance of the organism. This resistance is responsible for the destruction of the bacilli and liberation of lipoids, which stimulate the granulomatous reaction. When this resistance is absent, as in children, the reaction fails. However, it is possible that the presence of leprosy infection may stimulate a still higher resistance, and give a stronger reaction.

The author also found that the skin of normal human beings, suspended as an antigen by the Mitsuda technique and injected intradermally, gave a reaction similar to, but weaker than, the late Mitsuda reaction. This supports the belief that the Mitsuda phenomenon is not specific in nature but dependent on natural resistance. He considers that histological examination of the skin reacting to Mitsuda antigen may in doubtful cases help to distinguish between the tuberculoid and lepromatous type. Thus in healed lepromatous cases the structure of the lepromin reaction might show the amount of resistance, and the same might also throw light on the resistance of children whose lepromin had become positive after vaccination with BCG.

In a supplement the author reports more fully the results of injecting as an antigen the skin of normal persons prepared as a suspension by the Mitsuda technique (as already mentioned). Trials were made in 14 tuberculoid and 6 lepromatous cases. In 4 cases of tuberculoid and 1 of lepromatous leprosy there appeared between 4 and 6 hours an intense erythema measuring from 13 to 35 mm., but this had practically disappeared at 48 hours. There was a late reaction in 9 tuberculoid patients between the 9th and 63rd days, and in 6 of these there was a progressive persistent nodule (8·2 mm.) at about the 30th day. Histological examination showed that these nodules were not of a tuberculoid nature, but were composed of lymphocytes and monocytes with rare histiocytes. The late reaction was not shown in the lepromatous cases. The conclusion is that the other elements in the Mitsuda antigen, in addition to lepra bacilli, have some effect in producing the late reaction.

The whole work is of considerable value in clearing up unsolved difficulties about the lepromin test. The experiments and the conclusions drawn have been carefully planned, and they are beautifully illustrated with about 100 clearly reproduced photomicrographs. It is well worthy of the attention not only of leprologists but also of those interested in the study of allergy and resistance.

Ernest Muir

Bechelli, L. M. & Quagliato, R. Teste de Mitsuda na lepra tuberculóide em reação. [**The Mitsuda Test in Tuberculoid Leprosy during Reaction**] *Rev. Brasileira Leprologia.* S. Paulo. 1953, Mar., v. 21, No. 1, 51–8. [13 refs.]

Out of 119 cases of tuberculoid leprosy examined by the Mitsuda test during attacks of lepra reaction the result was negative in 14, doubtful in 1, weakly positive in 17, moderately positive in 44, and strongly positive in 43. The degree of positivity varied directly with the length of the reaction. When it had lasted 15 or more months the test was always positive. The longer the time after the onset of reaction the larger the percentage of positives. However, it was noted that when the Mitsuda test was repeated, say at intervals of 6 months, the results first obtained tended to be maintained on subsequent occasions. In some cases the clinical manifestations regressed very slowly and yet they remained active for 2, 3 or more years; in these the Mitsuda test remained negative or only slightly positive. Another factor was the number of lesions, a positive test being commonest in those with few lesions. The tests demonstrated that a positive test can co-exist with the presence of bacilli, but in the frankly positive Mitsuda cases the bacilli were not found on routine examination. *Ernest Muir*

Souza, R. de P., Ferraz, N. de T. & Bechelli, L. M. Influência do BCG vivo e morto sôbre a reação de Mitsuda. (Observações preliminares.) [**The Influence of Living and Killed BCG on the Mitsuda Reaction**] *Rev. Brasileira Leprologia.* S. Paulo. 1953, Mar., v. 21, No. 1, 43–50.

As the spontaneous changes in the lepromin test and the changes produced after vaccination with BCG, either living or dead, did not differ to a statistically significant extent, the authors were not able to come to any conclusion as to the relative effects on the lepromin test caused by living and killed BCG vaccine. They await the results of an experiment on a larger scale. *Ernest Muir*

Tisseuil, J. L'infection tuberculeuse pas plus que la vaccination par le B.C.G. ne crée ni para-immunité ni para-allergie à l'égard de la lèpre. [**Neither Tuberculosis Infection nor BCG Vaccination produces Para-immunity or Para-allergy to Leprosy**] *Rev. Coloniale de Méd. et Chir.* 1953, July 15, v. 25, No. 215, 132–4.

The author opposes strongly the hypothesis which he says is favoured in the world of leprologists, that BCG vaccination protects against leprosy. [It would be more correct to say that there is considerable evidence in favour of this theory, but that it is generally held by leprologists that its truth or otherwise can be established only by controlled trials which will require a number of years.] His reason for considering this hypothesis impossible is not based upon any experiments of his own, but on the fact that the delayed reaction in the Mitsuda test is not allergic and is therefore of a totally different nature from the allergic reaction in the tuberculin test. Had there been para-allergy between leprosy and tuberculosis then BCG would have produced an early allergic response with the lepromin test, as it does with the tuberculin test. The author considers that a delayed positive lepromin reaction after BCG indicates that the subject had previous sensitivity to lepromin, or has a tuberculoid leprosy lesion. "Experience in

penal settlements and immigration services proves that tuberculous premunition does not confer protection against leprosy" [abstracter's translation]. *Ernest Muir*

FARINA, R. Rinoneoplastia total na lepra. (Método Indiano.) **Rhinoplasty in Leprosy—Indian Method**] *Rev. Brasileira Leprologia.* S. Paulo. 1953, Mar., v. 21, No. 1, 7–12, 5 figs. English summary (4 lines).

DE SOUZA ARAÚJO, H. C. Eficácia do "Cortone" na reação leprótica causada pelas sulfonas. [**The Efficacy of "Cortone" in the Lepra Reaction Caused by Sulphones**] *Brasil-Médico.* 1953, Feb. 7 & 14, v. 67, Nos. 6/7, 83–7.

Cortone (acetate of cortisone) was used in treating lepra reaction in 6 cases of lepromatous leprosy (type L3). It was given in tablets of 25 mgm at the rate of 4 daily. In some of the cases this was associated with "Cebion forte" [a vitamin C preparation]. The patients took from 1 to 4 gm. of Cortone and all obtained relief from the symptoms of acute reaction. *Ernest Muir*

BLANC, M. & PROST, M. T. Le traitement actuel de la lèpre à la Léproserie Saint-Michel de Nden. [**The Present Treatment of Leprosy in the Leprosarium of St. Michel at Nden (French Cameroons)**] *J. Sci. Méd. de Lille.* 1953, Mar. 15, v. 71, No. 3, 129–39.

The paper is divided into 3 parts. The first deals with specific treatment, chaulmoogra preparations being preferred for tuberculoid cases and DDS for lepromatous. Secondly, as adjuvant treatment is recommended infiltration of the lumbar sympathetic with 1 per cent. novocaine in neuropathic conditions of the lower limbs. This was used in 150 patients with considerable benefit. Lastly, under prophylaxis, the authors describe the use of a killed acid-fast culture, that of "Chauviré", which is injected intradermally with a view to changing negative Mitsuda tests into positive. In 10 subjects exposed to leprosy infection, 2 remained or became negative, 2 became strongly positive, 4 became positive (1 of whom was originally positive), and 2 became weakly positive. Thus in 7 instances the test, previously negative, became positive; these subjects were not leprous. The authors are at present carrying out a further trial to compare the effects of this culture with those of BCG. *Ernest Muir*

TAYLOR, W. H. **The Treatment of Leprosy with Isonicotinyl Hydrazine. A Case Report.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, July, v. 47, No. 4, 334–5.

One patient is reported, an adult male African in Tanganyika with a history of leprosy for 10 years, and with pronounced nodules and areas of tuberculoid disease. Ear-clip smears showed innumerable acid-fast bacilli. He was given isoniazid 50 mgm. 3 times daily for the first week, and 100 mgm. 3 times daily thereafter. In 5 months the nodules were reduced to one-third of their original size, tuberculoid lesions were less marked, ear-clips showed no distinguishable remnants of lepra cells and there were approximately 40 whole bacilli and 60 granules per 100 fields, in place of the earlier uncountable numbers.

No untoward reactions were observed, and the author thinks that the obvious remission was unlike most remissions he has seen, and was probably the result of treatment with isoniazid. No other medication had been given. *Charles Wilcocks*

BLANC, M. & PROST, M. T. Nos conceptions et nos réalisations en ce qui concerne la prophylaxie antilépreuse. [**Our Conceptions and our Results as Regards Leprosy Prophylaxis**] *J. Sci. Méd. de Lille.* 1953, Mar. 15, v. 71, No. 3, 139–42.

The region described is calculated to contain 4,000 people with leprosy in a population of 60,000 (about 6·6 per cent.). "Segregation in spite of its antiquity has nothing venerable about it" [abstracter's translation]. In the first place it is impossible psychologically to disorganize the life of so many people. It is also economically impossible, as it would mean a town of 50,000 to hold all the people with leprosy in the French Cameroons. The system recommended is a Centre with a dispensary sufficient to treat 1,500 patients, a pavilion for case-taking and 4 wards sufficient to hold 150 patients. The dispensary has a large dressing hall, a pharmacy, 3 injection rooms, consulting rooms, a laboratory and operation room. In a second block there is a research pavilion, a church, a school and a building for professional re-education. There are also 4 sub-centres for treatment which are visited as frequently as possible.

Full particulars of local conditions, and of other patients in the villages, are gathered from those attending for treatment, thus making it easier to find out new cases when the villages are visited. It is hoped to look after a certain number of the children who would otherwise be exposed to infection, and it is also arranged to conduct a campaign of prophylactic vaccinations with BCG and "Chauviré" vaccines. *Ernest Muir*

HELMINTHIASIS

APARICIO GARRIDO, Jose and PRIETO LORENZO, Antonio. **Parasitologia y clinica de las helminthiasis.**

This book is reviewed on p. 1110.

CAMAIN, R. Schistosomiases génitales féminines et masculines à *S. haematobium* observées en Afrique Occidentale Francaise. [**Genital Schistosomiasis due to** *S. haematobium* **in French West Africa**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 3, 412–34. [13 refs.]

During the last 2 years in the laboratory at Dakar genital tissues removed at operation from 16 patients (10 female and 6 male) have been shown histologically to be pathologically involved owing to *Schistosoma haematobium* infection. The organs found so to be affected on 6 occasions were the female appendages, once the uterus itself, on 3 occasions the vagina, on 4 occasions in males the testicle or epididymis, and once the prostate gland. In the sixth male patient a calcified strand, containing *S. haematobium* eggs, was found incidentally in the course of an operation for repair of a strangulated inguinal hernia. Details are given of the histories and the findings in the individual cases; these should be sought in the original by those interested. *A. R. D. Adams*

GREMLIZA, L. Bilharziose der Harnwege und Behandlungserfahrungen mit dem Schistosomiasismittel Miracil-D. [**Schistosomiasis of the Urinary Tract and Results of Treatment with Miracil D**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1953, June, v. 4, No. 3, 394–410, 6 figs. [12 refs.]

A general review of the lesions in the urinary tract is given. The total course of treatment with lucanthone (Miracil D) for a 60 kgm. patient consisted of 1·6 gm. daily for two days, 1·2 gm. daily for two days and 0·8 gm. daily for three days (total dose 8 gm.). Full details (including cystoscopic appearances) are given of 10 cases (*S. haematobium*) which were treated in Iran.

In 6 of these cases the excretion of normal eggs in the urine ceased after 24 days, although dead and abnormal eggs continued to be passed. In the other 4 excretion of eggs persisted. These patients passed eggs resembling *S. intercalatum*, so they may have contained a different type of schistosome. In all the patients the cystoscopic appearances greatly improved, and so did the subjective reactions of the patients. Toxic reactions were slight, occurring between the fourth and sixth days. *F. Hawking*

WATSON, J. M. **Studies on Bilharziasis in Iraq. Part VIII. Relationship of Incidence to Age.** *J. Faculty of Med., Baghdad, Iraq.* 1953, v. 17, Nos. 1/2, 1–18, 1 graph. [34 refs.]

Hitherto it has generally been thought that schistosomiasis is predominantly a disease of youth rather than of adults and the aged. Children by virtue of their habits, it is said, are more prone to infection than are adults; additionally, it has been stated, with increasing age in adults there is increasing resistance to infection.

Analysis of the results obtained during the schistosomiasis survey carried out in Iraq in 1948–1951 has shown that among the 30,000 persons examined there was no significant difference in the incidence of the infection between the 5-year age groups up to and over 70 years of age. The risk of exposure to infection is similar for all ages of the population in Iraq, and it is concluded that any immunity that may result from increasing age affords only partial protection against superinfection and reinfection. [The material data are set out in a table and a graph.] *A. R. D. Adams*

HELLER, H. [**Schistosomiasis among Immigrants from Near East**] *Harefuah.* Jerusalem. 1953, June 1, v. 44, No. 11, [in Hebrew 243–4. English summary 245.].

The English summary appended to the paper is as follows:—

"The magnitude of the problem of Schistosomiasis in Israel, and the danger of endemicity and spread, are stressed in this review. It is conservatively estimated that some 20,000–30,000 Yemenites are infected by *S. mansoni* (and in a smaller number by *S. hematobium* as well); immigrants from Iraq, Egypt, and North Africa are infected only by *S. hematobium* and in much smaller percentage. Rectal biopsy and hatching test of stool are considered the most effective diagnostic methods and have uncovered many asymptomatic cases where employed as a routine examination in patients of Near East derivation; as well as in those cases clinically suspicious because of dysuria and hematuria on one hand, or complaints referable to the gastro-intestinal tract, hepato-splenomegaly, hepatic cirrhosis or hypersplenism, on the other.

"Tartar emetic intravenously has proved to be the most effective therapeutic agent, but its use involves direct doctor to patient treatment for a period of 4 to 6 weeks.

"The urgent need for definitive simple diagnostic procedures (skin test or complement-fixation test) and for a therapeutic agent orally administered and relatively free of undesirable side-actions is stressed, since both must be applied on a mass scale, if the disease is to be controlled."

PESSOA, S. B. Sôbre o valor da reação de formol-gel no diagnóstico da esquistossomose mansônica. [**The Value of the Formol-Gel Reaction in** *Schistosoma mansoni* **Infection**] *Brasil-Médico.* 1953, Feb. 21 & 28, v. 67, Nos. 8/9, 125–8. English summary.

The formol-gel reaction was found positive in 24 (26·6 per cent.) of 90 patients with *S. mansoni* infection, but only 3 gave strong reactions. There was slight indication that it was more frequently positive in far-advanced cases with hepato-splenomegaly (6 of 13) than in less severe disease, but the numbers are small. The author does not agree with those who regard this test as equal in value to the intradermal test. *Charles Wilcocks*

PADERSKI, B. [**Hepato-Splenomegaly in Schistosomiasis**] *Harefuah.* Jerusalem. 1953, June 1, v. 44, No. 11, [in Hebrew 247–8. English summary 248–9.].

The English summary appended to the paper is as follows:—

"1. Hepato-splenomegaly was observed in 69 of 100 cases of Schistosomiasis. In 33 of these, all infestations by S. mansoni, the spleen was enlarged to greater than 3 finger-breadths below the costal margin.

"2. The pathological changes in the liver and spleen are discussed. It is emphasized that ova were never discovered in the spleen, but frequently found in the liver when biopsy specimens were examined.

"3. A direct correlation exists between the magnitude of the hepato-splenomegaly and the clinical condition of the patient.

"4. Splenectomy was indicated in 11 cases because of the mechanical disturbances due to giant splenomegaly, bleeding oesophageal varices, progressive cirrhosis with wasting ascites, and hypersplenism. In 2 cases a spleno-renal anastomosis was established. All cases were definitely improved clinically.

"5. The etiology of hepato-splenomegaly in schistosomiasis is discussed and conflicting opinions mentioned.

"6. In our early experience hepato-splenomegaly was the predominant physical finding directing our attention toward schistosomiasis. Later, however, many cases without this feature were discovered when rectal biopsy was performed routinely on Yemenite patients."

KARIV, I. [**Cardiac Problems in Schistosomiasis**] *Harefuah.* Jerusalem. 1953, June 1, v. 44, No. 11, [in Hebrew 249–50. English summary 250.].

The English summary appended to the paper is as follows:—

"1. The conflicting reports of cardiac involvement secondary to Schistosomiasis are discussed. In 100 cases observed only one case of chronic cor

pulmonale was found, and that in a patient suffering from, and most probably consequent to, bronchial asthma.

" 2. The effect of tartar emetic on the electrocardiogram was studied:

" (a) In 93 of the 100 patients E.K.G. was normal prior to therapy.

" (b) In 85 of 100 cases progressive lowering of the T waves in all leads, frequently succeeded by T wave inversion, was observed during therapy.

" (c) In 20 cases the E.K.G. had returned to normal within two weeks after completion of therapy.

" (d) Attempts to prevent these T changes in several cases by the administration of potassium salts, ACTH, and gynergen were to no demonstrable effect.

" 3. In several cardiacs no untoward effects were observed due to therapy with tartar emetic."

McQuay, R. M., Jr. **Studies on Variability in the Susceptibility of a North American Snail,** *Tropicorbis havanensis*, **to Infection with the Puerto Rican Strain of** *Schistosoma mansoni*. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Jan., v. 47, No. 1, 56–61, 1 fig. [25 refs.]

" (1) Susceptibility of Baton Rouge *Tropicorbis havanensis* Pfeiffer to infection with a standardized strain of *Schistosoma mansoni* of Puerto Rican origin was not markedly increased by selecting susceptible inbred stocks through five to eight generations.

" (2) Nearly 17 per cent. of 495 experimental snails shed cercariae. Of these, 6·9 per cent. shed following single exposure, while an additional 9·9 per cent. became positive on one, two or three re-exposures. The percentage of parasitized snails became progressively higher with the number of exposures. The trend in proportions was significantly upwards. The slope of the line fitted to these data indicates an average increase of 7·4 per cent. per exposure.

" (3) Adults and large juveniles were more susceptible than younger ones. Age and/or size, then, appear to have some influence upon susceptibility in this species of snail."

Paraense, W. L. & Santos, J. M. Resultados preliminares de um inquérito sôbre esquistossomose am planorbídeos de Lagoa Santa. [**Preliminary Results of an Investigation on Schistosomiasis in Planorbids in Lagoa Santa, Brazil**] *Rev. Assoc. Med. Minas Gerais.* 1952, Mar.–June, v. 3, Nos. 1/2, 59–61. English summary.

Sioli, H. **Schistosomiasis and Limnology in the Amazon Region.** *Amer. J. Trop. Med. & Hyg.* 1953, July, v. 2, No. 4, 700–707, 1 fig. [19 refs.]

" The limnological conditions at Fordlandia (State of Pará, Brazil), at present the only known place with endemic schistosomiasis *mansoni* in the entire Amazonian region, are propitious for the development of planorbid snails since the Carboniferous formation is responsible for surface waters of almost neutral reaction, which seems to be a requisite for survival and multiplication of these snails, as shown by surveys of many Amazonian areas where waters are acid and these snails are absent. It is concluded that, with colonization by immigrants from Northeast Brazil and other regions infected with schistosomiasis, the disease may become endemic in the regions with Carboniferous strata north and south of the Amazon, but there is little danger of this in the rest of the great area of the Amazon basin."

NEWTON, W. L. & HASKINS, W. T. **A Comparison of the Dosage-Mortality Responses of some Strains of *Australorbis glabratus* to Sodium Pentachlorophenate.** *Amer. J. Trop. Med. & Hyg.* 1953, July, v. 2, No. 4, 708–15, 1 fig.

"Several laboratory strains of *Australorbis glabratus* were compared for their relative susceptibilities to the lethal action of sodium pentachlorophenate. A Venezuelan, a Puerto Rican, a Brazilian (Bwt), and a Brazilian albino mutant (Bm) strain derived from the latter, were used. Each strain had been maintained in the Laboratory for at least 3 years.

"The estimated LD_{50}'s, at 24 hours and at a mean temperature of 80°F. (78°–84°F), for the Bm, Bwt and Venezuelan strains were 0·68±·016, 0·80±·013, and 1·06±·020 p.p.m., respectively. Significantly different slopes were also obtained when probit lines were fitted to the dosage-mortality data for each strain. These findings indicated that these three strains of *A. glabratus* differed in average susceptibility and in homogeneity. On the basis of results with fewer tests, the dosage-response characteristics of the Puerto Rican strain appeared to be similar to those of the Venezuelan strain.

"The relationship of these findings to the general problem of the control of *A. glabratus* with sodium pentachlorophenate is discussed."

[See also this *Bulletin*, 1950, v. 47, 56, 143.]

NOLAN, M. O., BOND, H. W. & MANN, Elizabeth R. **Results of Laboratory Screening Tests of Chemical Compounds for Molluscicidal Activity. I. Phenols and Related Compounds.** *Amer. J. Trop. Med. & Hyg.* 1953, July, v. 2, No. 4, 716–52. [12 refs.]

"Seven hundred and one phenolic type compounds were tested for their activity against *Australorbis glabratus*, the snail vector of *Schistosoma mansoni* in the Western Hemisphere.

"Correlations have been drawn between structure of the chemical compounds and molluscicidal activity.

"The most active compounds were found among the highly halogenated phenols, the dinitroalkyl- and arylphenols, the 'bisphenol' type of compound and the mercurated phenols.

"On the basis of availability and cost, pentachlorophenol or its salts would appear to be the molluscicide of choice at this time."

[See also this *Bulletin*, 1950, v. 47, 56, 143.]

ALTMANN, H. W. & GÖNNERT, R. II. Über funktionell bedingte Hypertrophien und Hyperplasien. Untersuchungen am intrahepatischen Gallengangsystem der weissen Maus bei experimenteller Bilharziose [**On artificially produced Hypertrophies and Hyperplasias. Investigations on the Intrahepatic Biliary Passages of the White Mouse during Experimental Schistosomiasis**] Reprinted from *Beitr. pathol. Anat.* 1952, v. 112, No. 1, 8–35, 8 figs. [96 refs.]

When mice are infected with *S. mansoni* for chemotherapeutic investigations, various changes occur in the liver in the neighbourhood of the worms and eggs. These are most marked when cell infiltration and the formation of pseudotubercles have occurred round the eggs; and they persist for a long time after the worms have been killed by treatment with lucanthone (Miracil D). In the hepatic biliary system there takes place a reversible

hypertrophy of the single cells together with a mitotic hyperplasia which leads to convolution of the epithelium producing sinusoid indentations and supplementary glands. Later these changes may completely disappear again. There is also increased functional activity of the epithelium of the biliary passages and vigorous secretory activity, as is shown by the cytological appearance of the cells. These changes are provoked by products liberated from the parasites, either by the death of the worms or that of the eggs in the liver; and they correspond in their timing to the increasing or decreasing amounts of these substances which are liberated. [For the fuller description and the illustrations of these changes in the biliary passages, the original paper should be consulted.] *F. Hawking*

SCHWETZ, J. Sur un nouveau foyer de schistosomose des rongeurs due à *Schistosoma rodhaini*. Découverte d'un nouvel hôte intermédiaire, *Planorbis tanganyikanus* Bourguignat [**A New Focus of Schistosomiasis of Rodents Caused by** *S. rodhaini* **and Record of a New Intermediate Host,** *Planorbis tanganyikanus*] *Ann. Parasit. Humaine et Comparée.* 1952, v. 27, No. 6, 578–87, 4 figs.

See this *Bulletin*, 1953, v. 50, 429.

STUNKARD, H. W. & HINCHLIFFE, M. C. **The Life-Cycle of** *Microbilharzia variglandis* (= *Cercaria variglandis* **Miller and Northup, 1926), an Avian Schistosome whose Larvae produce "Swimmer's Itch" of Ocean Beaches.** Reprinted from *Anatomical Record.* 1951, Nov., v. 111, No. 3, 1 p.

After a brief account of the life-cycle of *Microbilharzia* [*Cercaria*] *variglandis*, the authors refer to a severe dermatitis of bathers and fishermen in Narragansett Bay, Rhode Island. Similar reports have come from other areas of the Atlantic coast, from the east coast of Florida and from southern California: in the last case *Cercaria littorinalinae* was incriminated [this *Bulletin*, 1951, v. 48, 172]. In all these geographical regions, the clinical manifestations have been apparently identical. The dermatitis has been produced by *C. variglandis* in volunteers sensitized to it and in others sensitized to larvae of freshwater schistosomes only. It is concluded that the antigenic substances of marine and freshwater avian schistosomes are closely similar and may be identical. *H. J. O'D. Burke-Gaffney*

WEINSTEIN, P. P., DUMAN, L. J., TRELAWNY, G. S. & PATTERSON, J. C. **Paragonimiasis: Failure of Nilodin in Therapy and Report of One Case with Urinary Tract Involvement.** *Amer. J. Trop. Med. & Hyg.* 1953, May, v. 2, No. 3, 517–23, 2 figs. [15 refs.]

There is no drug that appears to have any significant specific action on infection with *Paragonimus westermani*; a limited success has been achieved by emetine hydrochloride alone and in combination with sulphonamides.

Nilodin (1-diethylamino-ethyl-amino-4-methyl-thioxanthone) has shown definite activity in *Schistosoma haematobium* infections, but is less effective in *S. mansoni* infections and apparently inactive in *S. japonicum* infections.

A trial of the value of Nilodin in *P. westermani* infection was made in 11 patients; they were admitted to hospital during the trial.

Seven patients were given a total dose of 75 mgm. of Nilodin per kgm. of body weight, divided over a period of 6 days; on the average, a dose of 300 to 400 mgm. was taken morning and evening. Four received tablets of

aspirin. Sputum egg counts were recorded at intervals for about 2 weeks before and 2 weeks after treatment; 5 such counts were recorded in each case.

Only 4 patients showed any abnormality on X-ray examination before treatment.

Of the treated patients, 6 showed a reduction in the average egg count, but this was only slight; 3 controls also showed a similar reduction. No patient showed any striking clinical or any radiological improvement. The slight reduction in egg counts was attributed to the rest and other favourable conditions to which the patients were subjected in hospital, and it was concluded that Nilodin had no effect.

A case of paragonimiasis in which both the lungs and the urinary tract were involved is reported.

The patient, who had previously been diagnosed as having pulmonary paragonimiasis, now complained of frequency and incontinence of urine, fever, weakness and generalized oedema of three months' duration. He passed in his urine an average of 5,966 *Paragonimus* ova in 24 hours during a period of 3 weeks' observation before treatment. The ova usually had pus cells attached but were otherwise normal.

This infection was treated by daily intramuscular emetine hydrochloride combined with sulphadiazine 0·5 gm. four times daily, for 10 days. Nilodin was also given, a total of 75 mgm. per kgm. during a period of 6 days. After treatment repeated examinations of 24-hour specimens of urine over a period of 6 weeks failed to show any ova. It is concluded that the emetine and sulphadiazine were responsible for this apparent cure. Cystoscopy did not reveal any abnormality. *L. E. Napier*

Komiya, Y., Yokogawa, M., Shichijo, K., Nishimiya, H., Suguro, T. & Yamaoka, K. **Studies on Paragonimiasis in Shizuoka Prefecture. II. Studies on the Treatment of Paragonimiasis.** *Japanese J. Med. Sci. & Biol.* 1952, Dec., v. 5, No. 6, 433–45.

Repeated and extended post-treatment examinations are essential in evaluating the effects of chemotherapy in paragonimiasis. The authors investigated the effects of emetine in combination with 3 different sulphonamide compounds—" sulfamine, sulfathiazole and sulfadiazine ". The drugs were given for 10 days without interruption. Emetine was given intravenously, thus avoiding " pain and abscesses which characterize intramuscular or subcutaneous injections ". By slow injection side reactions were almost completely avoided. A total of 0·4 gm. emetine was given to adults, with 40 gm. of sulphonamide in the 10-day period. A patient was considered to be cured if both sputum and faeces were negative 4 months after treatment. Five out of 32 were considered to be cured; there was no significant difference between the effects of the 3 sulphonamides. Search must continue for a drug or combination of drugs more effective than emetine. Longer or repeated treatments might be considered.

G. R. McRobert

Govaert, J. **Deoxyribonucleic Acid Content of the Germinal Vesicle of the Ovocyte in** *Fasciola hepatica*. [Correspondence.] *Nature*. 1953, Aug. 15, v. 172, 302–3, 1 fig.

Kendall, S. B. **The Life-History of** *Limnaea truncatula* **under Laboratory Conditions,** *J. Helminthology*. 1953, v. 27, Nos. 1/2, 17–28, 2 figs. [14 refs.]

VIRANUVATTI, V., STITNIMANKARN, T. & TANSURAT, P. **A Fatal Case of Infection with *Fasciolopsis buskii* in Thailand.** *Ann. Trop. Med. & Parasit.* 1953, June, v. 47, No. 2, 132–3.

"A fatal case of *Fasciolopsis buskii* infection in Thailand is described, and a report is given of the salient clinical and autopsy findings. The case is of interest from the fact that the patient had lived all her life in a province where the infection had hitherto been unknown."

CARTER, F. S. **Cerebral Cysticercosis. A Case Report.** *East African Med. J.* 1953, July, v. 30, No. 7, 295–301, 2 pls. [12 refs.]

"A case report of a seven year old Kikuyu girl suffering from cerebral cysticercosis, who presented with Jacksonian epilepsy.

"Radiographs revealed numerous calcifying cysticerci in the brain, but only a solitary calcified cysticercus in the soft tissues.

"The cerebro-spinal fluid showed a transitory increase in the cell count and a rise in the protein content of the fluid.

"Attention is drawn to the fact that *T. solium* infestation is more widespread in Kenya than previously recognised."

TREVIÑOV, A. & SANDOVALC, A. Tratamiento con atebrina de 62 pacientes parasitados con *Taenia*. [**Sixty-two Patients with Taeniasis treated with Atebrin**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1953, Mar., v. 13, No. 1, 77–9. [10 refs.] English summary (6 lines).

The use of atebrin [mepacrine] for cestode infection was first reported by CULBERTSON in 1940, who gave it to mice infected by *Hymenolepis fraterna*. Since then it has been used in man for *H. nana* and *Taenia saginata* infections [this *Bulletin*, 1950, v. 47, 255, where other references are given, and 1951, v. 48, 1134]. The present authors record their results in 62 patients, 40 males, 22 females, whose ages ranged between 3 and 67 years; 54 were harbouring *T. saginata*, 8 *T. solium*, and in 5 both were present. The régime was as follows: the day before treatment a light breakfast of a cup of coffee with milk and a slice of toast; dinner (or late breakfast) soup without condiments, 80–100 gm. of roast meat, coffee with milk and toast; supper the same as early breakfast, and at 8 p.m. a saline laxative. The next day at 8 a.m., before any food, a capsule of 0·1 gm. phenobarbitone was given and half an hour later 2 tablets of atebrin, each of 0·1 gm., repeated at 5-minute intervals till 8 tablets had been taken, and with each tablet of atebrin was given a capsule of 0·6 gm. of sodium bicarbonate. Two hours later a saline aperient, 25–35 gm. sodium sulphate, was given and the patient stayed in the room until the purgative had acted. The above is the dosage for adults; 7 of the patients were under 12 years of age and for them the dosage, both of the phenobarbitone and the atebrin, was reduced.

In 50 of the 62 the scolex was passed. [The authors' account of the other 12 is not clear. They say that 5 did not expel proglottides, so presumably 7 did so, but in their summary they say that the worm was expelled from 55, which they call 88 per cent. In 2 the result was not known and 5 remained parasitized.] The only toxic symptom was vomiting which occurred in 11 patients and in 4 was severe enough to put a stop to the

treatment. One patient showed a yellow discoloration of the skin and on this account patients are advised to keep from exposure to the sun's rays for 20 days after the treatment. *H. Harold Scott*

VALENTINČIČ, M. Okužba človeka s parazitom *Hymenolepis diminuta*. [**Our First Case of Tapeworm Infection of Genus** *Hymenolepis diminuta*] *Zdravstveni vestnik*. Ljubljana. 1953, v. 22, No. 6, 162–3, 1 fig. English summary (8 lines).

This appears to be the first record from Slovenia.

MILLER, M. J. **Hydatid Infection in Canada.** *Canadian Med. Ass. J.* 1953, May, v. 68, No. 5, 423–34, 1 diagram, 1 map & 22 figs.

The author investigated the incidence of *Echinococcus granulosus* in dogs and wild carnivora in Northern Canada and of its hydatid cysts in man and wild herbivora. In Canada the adult tapeworm has been found in the dog, wolf, coyote, fox and the Arctic fox, but the wolf is the most important definitive host. The most important intermediate hosts are the moose and caribou, but hydatid cysts have been found also in the elk, reindeer, coast deer, white-tailed deer and bison, and possibly all wild herbivora can become infected. The possibility that rodents play a part in the spread of the infection requires investigation.

The author concludes that *E. granulosus* is well established in the carnivora of British Columbia and across Northern Canada, particularly in the wolves, which seed this huge area with the eggs of the tapeworm. The eggs are picked up by the herbivora, especially by moose and caribou, in which the hydatid cysts develop. The wolves infect themselves by killing and eating moose and caribou. This cycle had probably existed for centuries. It has no economic importance, except that it may affect the health of the moose and caribou. Man rarely, if ever, acquires infection from the wild carnivora; but, when he gives the infected lungs of moose or caribou to his dogs, he may accidentally infect himself with the eggs of the tapeworm and may then acquire hydatid disease.

Among the Indians in the Indian Reservations in British Columbia, Alberta and the North-West Territories, the incidence of hydatid cysts acquired in this way is sufficient to constitute an important medical problem. Of 114 dogs examined in the Indian Reservations 32 (28 per cent.) were infected with *E. granulosus*.

Information, based on hospital records and X-ray films, is given of about 141 human patients with proved or suspected hydatid disease. Of these, 28 were verified by either surgical means or post-mortem examinations. In addition a total of 842 patients were skin-tested with sterile hydatid fluid collected from hydatid cysts in domesticated animals in Australia. Of these 15 were positive and 12 gave doubtful reactions. Blood smears taken from 25 persons showing doubtful or positive skin reactions were examined for eosinophilia, but it was not possible to draw any conclusions about the value of eosinophilia as an aid to the diagnosis of hydatid disease. Three cases were in Eskimos, 136 in Indians and 2 in Whites. The youngest patient was a child aged 2½ and the oldest a woman aged 83. Infections occur with about the same frequency in both sexes. The incidence in children under 7 is much lower than in older patients and people over 70 show 3 times the infection rate of the others. In 97 cases the cysts were in the lungs, in 44 in the liver.

The author reproduces X-ray photographs showing cysts in the lungs and liver in man in support of his view that "the prognosis in pulmonary

hydatid infection may not be as bad as general medical opinion would indicate ". He believes that pulmonary hydatid cysts may, but rarely do, cause disease while they are growing. Eventually they rupture into a bronchus and are coughed up. At this stage there may be temporary illness, which may develop into a serious chronic disease, such as lung abscess, but in most cases a natural cure probably occurs. The author believes that a high percentage of hydatid cysts of the liver of man are rendered non-viable naturally and cease to grow and become calcified, but in other parts of the body, such as the brain or bones, they may be a serious threat to health or life. *G. Lapage*

ROBINSON, R. G. **Primary Hydatid Disease of the Brain. Report of a Case.** *New Zealand Med. J.* 1953, June, v. 52, No. 289, 194–6, 2 figs. on pl.

DE PASQUALE, N. & QUATTROCCHI, G. Sul comportamento delle frazioni proteinemiche nell'anchilostomiasi. [**Serum Protein Fractions in Ankylostomiasis**] *Acta Med. Italica.* 1953, May, v. 8, No. 5, 123–6. English summary.

The authors have investigated some of the blood conditions occurring in ankylostomiasis. These are grouped together under the term *haemochromocytometric examination* and include not only the estimations mentioned in the title, namely total protein (by a modification of Cohn's method), the serum albumin, serum globulin, alpha, beta and gamma, but also the numbers of erythrocytes and leucocytes and a differential count of the latter, the red corpuscle sedimentation rate noted after one and after two hours, the results of sternal puncture and the Wuhrmann & Wunderly sulphate of cadmium test [this appears to be some flocculation test, but it is not described though a reference is given to a publication by these authors in 1947].

The findings in 9 patients are detailed; their ages ranged between 16 and 54 years, and they presented considerable variations. These, however, can be summarized by saying that they all showed a lowering of the total serum protein due to fall in the albumin, greater than a relative increase in globulin; this last was found in alpha, beta and gamma globulin, but most in the gamma fraction. The total protein before treatment ranged between 5·8 and 7·42 gm. per cent. (normal 7·42); the albumin between 2·05 and 3·82 (normal 4·05); α-globulin between 0·8 and 1·35 (normal 1·52); β-globulin 0·3–0·6 (normal 0·55), and γ-globulin between 2·0 and 2·39 (normal 1·7). The Wuhrmann & Wunderly reaction was positive in only 3 of the 9 patients. It was found that, after eradication of the infection and restoration from the anaemia, the serum protein did not return to normal for " a long time ". [This is not specified, though it is remarked that the oedema did not disappear until the serum protein became normal.] *H. Harold Scott*

PÉREZ-SANTIAGO, E., OLIVER-GONZÁLEZ, J. & THILLET, C. J. **The Effect of a Cyanine Dye on Infections with Hookworm and *Trichuris* in Man.** *Amer. J. Trop. Med. & Hyg.* 1953, Mar., v. 2, No. 2, 307–10.

It has already been shown that certain cyanine dyes have anthelmintic properties. Among these dyes is a group, one representative of which, namely 1′-ethyl-3,6-dimethyl-2-phenyl-4-pyrimido-2′-cyanine chloride, is effective in the treatment of the filariasis of the cotton rat. A closely allied

compound has been shown [HALES and WELCH, this *Bulletin*, 1953, v. 50, 630] to be effective in canine nematode infections; this latter drug, No. 715, is the subject of the trial reported below.

Six indigent males with heavy hookworm infections and severe to moderate anaemia were admitted to hospital. The treatment regimen varied but usually the drug was divided into three doses and given during one day, an average total amount of about 20 mgm. per kgm. body weight. Five patients received at least 2 courses each, and altogether 15 courses were given to the 6 patients.

After each course of treatment the number of worms passed in the faeces was noted. Finally, a course of tetrachlorethylene was given. The worms removed by each drug were counted.

The effect of the former drug was relatively poor. A single course of treatment removed 10·6, 12·1, 31·0 and 37·9 per cent. of the total worms removed in four cases respectively, and in a fifth 79·7 per cent. were recovered after 3 courses. The subsequent treatment with tetrachlorethylene removed the remainder, it was assumed.

A few *Trichuris trichiura* (a total of 25 in 5 cases) were also removed by No. 715; only 4 were subsequently recovered after the tetrachlorethylene course.

The unpleasant effects included epigastric pain, nausea, vomiting, mild diarrhoea and anorexia; these were frequent and one patient developed a low pyrexia on 2 occasions. No by-effect necessitated discontinuance of the drug.

The authors concluded that No. 715 was neither as effective an anthelmintic as tetrachlorethylene, nor as well tolerated. *L. E. Napier*

AMBERSON, J. M. & SCHWARZ, E. *Ternidens deminutus* **Railliet and Henry, a Nematode Parasite of Man and Primates.** *Ann. Trop. Med. & Parasit.* 1952, Nov., v. 46, No. 3, 227–37, 5 figs. on 2 pls. & 2 maps. [20 refs.]

This is a general account of *Ternidens deminutus*. A brief historical review of the species is given and 6 published case histories in which the parasites were found at autopsy are quoted in full. From these it appears that *Ternidens* occurs from the duodenum to the colon, not, as stated in most text-books, in the colon only. The geographical distribution in Africa and Asia is listed and illustrated on two maps and an account is given of its occurrence in 10 species of primates. *J. J. C. Buckley*

TAN KOK SIANG & LIE KIAN JOE. **Redescription of** *Oesophagostomum apiostomum* **(Willach, 1891, Railliet and Henry, 1905) from Man and Monkeys in Indonesia.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1953, June, v. 5, No. 2, 123–7, 9 figs.

[See also this *Bulletin*, 1949, v. 46, 955.]

BLUMBERG, B., MCGIFF, J. & GUICHERIT, I. **A Survey of Intestinal Parasites in the Schoolchildren of Moengo, Surinam, 1950.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1953, June, v. 5, No. 2, 137–40.

"(1) Using the direct smear technique, a stool survey of 441 schoolchildren of Moengo revealed that 53 per cent. were infected with intestinal parasites, 42 per cent harbouring *Ascaris lumbricoides*, 8 per cent *Necator americanus*, and 9 per cent *Trichuris trichiura*.

" (2) The schoolchildren residing in Moengo proper (mainly coloured) had a higher incidence of parasitic infection than those residing in the Javanese settlement.

" (3) The infection rates in males and females were similar.

" (4) Although adequate disposal facilities for excreta are available, the incidence of these infections is surprisingly high. This is probably due to the poor personal sanitation habits of the children.

" (5) The incidence of hookworm infection is less than that of the other organisms, although the conditions are presumably favourable for its spread. This is probably due to its early detection and treatment in the Moengo Hospital."

DE PAOLA, Giovanna & MASTRANDREA, G. Studio dell'ossalemia in alcune elmintiasi. [**The Study of Oxalaemia in Certain Helminthiases**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1953, Mar., v. 34, No. 3, 145–59. [29 refs.] English summary.

Oxalaemia and oxaluria are either exogenous or endogenous according to whether the oxalic acid has been absorbed as such through the intestine or is the product of intermediate metabolism within the tissues. In its turn, exogenous oxaluria may be due to oxalic acid which is either (a) already formed in the food, and (b) produced after ingestion by the interaction of appropriate food material and the intestinal flora. Vegetables of the genera *Rumex*, *Rheum*, *Oxalis*, such as spinach, tomatoes, rhubarb and cocoa, are instances of foodstuffs which contain oxalic acid.

The authors of the present paper have studied the oxalic acid content of blood and urine in a total of 24 subjects of whom 12 had *Ascaris* infection, 6 *Taenia*, 2 *Trichuris*, 2 hookworm, 1 hookworm and *Ascaris*, and both *Ascaris* and *Trichuris*. Five normal subjects were also studied as controls; all were adults. Most of the infected patients complained of dyspepsia and showed symptoms of neuro-sympathetic disturbance. Two cases of ascariasis showed no rise in the blood oxalic acid nor any dyspeptic or neuro-sympathetic disturbances.

The blood oxalic acid was estimated by the method of Merz and Maugeri, *viz.* treatment with trichloracetic acid, addition of calcium hydroxide to the filtrate to precipitate the calcium oxalate, oxidation of this with excess permanganate and final titration with sodium hyposulphite and iodine. The blood of the controls gave oxalic acid readings of 3·2 to 7·8 mgm. per cent., with an average of 4·77. Except for the 2 cases of ascariasis mentioned above, the readings in cases of helminthiasis showed a definite increase of blood oxalic acid. Generally speaking, a raised oxalic acid content went with a slightly lowered blood calcium but no definite relationship was evident. Oxalic acid crystals were frequently found in the urine but no measurements were made. There was little obvious eosinophilia in this particular series of cases.

The blood oxalic acid was estimated in 5 cases after treatment and found to have diminished. *J. Cauchi*

ROMBERG, R. G. **Intestinal Obstruction due to Ascariasis.** *East African Med. J.* 1953, June, v. 30, No. 6, 251–2.

The author records 4 cases of intestinal obstruction due to *Ascaris* infection, in one of which laparotomy and removal of the worms by enterotomy were necessary. The patient was an African boy aged 3, who

complained of fever, abdominal pain, nausea and vomiting. The temperature was 106°F., distension was slight and multiple small, firm, moveable masses were felt in the abdomen. Worms were vomited and passed in the stools. On the seventh hospital day the child had not improved under medical treatment and signs of peritonitis were evident. A laparotomy was performed and 124 worms were removed from the ileum by enterotomy. The bowel wall was ischaemic from the pressure of the mass of worms. Recovery was uneventful.

The other three patients were all African children presenting much the same symptoms and in all cases palpable masses in the abdomen were present; they responded to treatment with diethylcarbamazine (Banocide), 5 mgm. per kgm. 3–4 times daily.

The author contends that *Ascaris* usually produces a partial obstruction without much distension, but with ischaemia of the bowel wall. Diethylcarbamazine is non-toxic even in large quantities, is insoluble in liquid paraffin and the worms are passed out dead, which is not the case with santonin and oil of chenopodium.

[The surgical complications of ascariasis have been very well described by De Sa [see this *Bulletin*, 1952, v. 49, 978]. He records 15 cases of acute obstruction in 61 patients. He advised that the incision in the bowel wall be not made directly over the mass, on account of the ischaemia.]

W. L. Harnett

Bhaduri, N. V. & Sanyal, P. K. **Cashew-Nut** (*Anacardium occidentale* **Linn) Shell Oil as an Anthelmintic in Human Helminthiasis—a Preliminary Note.** *Indian Med. Gaz.* 1952, Dec., v. 87, No. 12, 573–5.

"1. The shell oil of cashew-nuts prepared for the above work has been used in the treatment of hookworm and roundworm infections of man. Seven out of ten cases of *Ascaris* infection were cured by one treatment. Sixteen cases of hookworm infection were treated and after one treatment six were cured and three of the remaining cases showed substantial reduction in the egg-count. After a second treatment the number of total cure was nine and two more showed a good degree of reduction in the egg-count and were almost cured from practical point of view. The drug did not produce any toxic symptoms and was well tolerated."

[See also this *Bulletin*, 1951, v. 48, 1023.]

Hopkins, C. A. & Nicholas, W. L. *Culicoides austeni*, **the Vector of** *Acanthocheilonema perstans*. *Ann. Trop. Med. & Parasit.* 1952, Nov., v. 46, No. 3, 276–83. [10 refs.]

As a result of an investigation in the British Cameroons, Dyce Sharp's claim [this *Bulletin*, 1928, v. 25, 473] that *Culicoides austeni* is a vector of *Dipetalonema perstans* has been confirmed. The validity of this claim had been questioned by Chardome and Peel and Henrard and Peel [this *Bulletin*, 1950, v. 47, 65, 66] in their work describing the development of *Dipetalonema streptocerca* in *Culicoides grahami*. Special care was exercised in the present experiments to eliminate any possibility of error by using laboratory-bred flies reared from third and fourth instars and pupae; and by repeated examinations of the 5 Africans on whom the flies were fed it was ascertained that the only filariid infection harboured by them was *D. perstans*. In all, 71 *C. austeni* were each given a single infective blood meal and on dissection at varying intervals later, 29 were found to be infected. Migration of the larvae to the head of the insect occurred by the

ninth day. There was fair correlation between the number of larvae developing in each fly and the estimated theoretical number expected, but in all cases there was a greater number than was expected.

The rôle of *C. grahami* as a vector was also investigated, by feeding 481 "wild" flies on the human *D. perstans* carriers and it is concluded that this species is a possible but poor vector, as only 2 were found infected. No natural infections were found on dissecting 350 unfed wild *C. grahami*.

J. J. C. Buckley

WANSON, M. & RODHAIN, J. Développement abortif de *Loa papionis* chez divers arthropodes. Insuccès du traitement à la diéthylcarbamazine dans la filariose diurne du Babouin. [**Abortive Development of *Loa papionis* in Various Arthropods. Failure of Hetrazan in the Treatment of Diurnal Filariasis in Baboons**] *Ann. Soc. Belge de Méd. Trop.* 1953, Apr. 30, v. 33, No. 2, 177–84. [12 refs.]

MARTÍNEZ BÁEZ, M. Nuevos datos acerca de la acción del Hetrazán sobre *Onchocerca volvulus* al estado adulto. [**Fresh Information on the Action of Diethylcarbamazine (Hetrazan) on *Onchocerca volvulus***] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1953, Mar., v. 13, No. 1, 71–5. English summary.

The author has previously brought forward evidence that diethylcarbamazine acts not only on the embryos of *O. volvulus* but also on the adult worms [this *Bulletin*, 1953, v. 50. 437]. In the present paper he adduces further evidence of this and also that the effect is greater according to the length of interval between administration of the drug and examination of the extirpated tissue. From 108 patients (51 males, 57 females, ages ranging between 1 and 58 years, average 19 years) 152 nodules were extirpated and examined in stained sections. The dosage for adults was 2·5 gm. diethylcarbamazine in the course of 10 days. Of the 152 nodules examined, 63 (41·4 per cent.) showed changed worms only and 33 (21·7) both normal and changed worms, i.e., altered adult worms were found in 96 (63·1 per cent.). Some of the patients had received the treatment 4 months before the extirpation, some 2 months and some only 10 days before.

The numbers of nodules showing normal and altered worms and those showing altered worms only are given for each of these periods, but the general findings may be summed up by saying that 60 per cent. of the nodules of those who had had the drug 10 days before contained altered worms; 63·2 per cent. of those who had had the treatment 2 months before, 69 per cent. of those treated 4 months before. This conclusion that the longer the interval between administration and examination, the greater the effect on the adult worm, finds confirmation in the fact that 75 per cent. of those examined 1 year after the treatment showed these changes.

H. Harold Scott

BAYLET, R. Considérations sur le traitement local de l'onchocercose en particulier par injection de Notézine intrakystique. [**Local Treatment of Onchocerciasis, particularly by Injection of Diethylcarbamazine (Notezine, Hetrazan) into the Cysts**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 3, 335–8.

The first patient was a man 25 years old with 2 cysts on the ribs and occiput, filarial pruritus (*gale*), and complete blindness beginning 3 months earlier. He was given 4 tablets of diethylcarbamazine (Hetrazan) by mouth daily for 10 days, and this course was repeated after an interval of 10 days.

Vision was greatly improved; and microfilariae were no longer found in the skin but were still found by puncture of the cysts on the 20th and 45th days. It was concluded that diethylcarbamazine given by mouth destroys the microfilariae in the skin but not those in the cysts.

Accordingly the author tried injecting 1 per cent. aqueous solution of diethylcarbamazine into the cysts, *e.g.*, 0·5 cc. on two days into a small early cyst. In 5 out of 20 cases the cyst subsequently diminished greatly in volume. On the other hand, with large old sclerosed cysts, intracystic injection of diethylcarbamazine had little effect, either on the worms and microfilariae in the cysts, or on the microfilariae in the skin. Besides, the masses (which appear on palpation to be single large cysts) prove (when excised) to consist of a bundle of small cysts bound together; injections made into such a mass would not reach more than 1 or 2 of the constituent cysts. And further, there are usually many other small cysts elsewhere which are difficult or impossible to locate. For this reason it is impossible to free the body from worms either by injections made into the cysts, or by their excision. *F. Hawking*

Caballero y C., E. & Grocott, R. G. Nota sobre la presencia de *Capillaria hepática* en un mono araña (*Ateles geoffroyi vellerosus*) de México. [**Presence of** *Capillaria hepatica* **in a Spider Monkey in Mexico**] *An. Inst. Biol.* Mexico. 1952, v. 23, Nos. 1/2, 211–15, 2 figs. [11 refs.]

The authors report the first case of *Capillaria hepatica* infection recorded in Mexico. It was found, in the course of yellow fever survey, in sections of the liver of a spider monkey, *Ateles geoffroyi vellerosus* in Chiapas. Numerous eggs were seen and 2 photomicrographs of liver sections illustrate the typical bipolar forms.

The authors discuss briefly the literature relating to this infection and of the records of cases, genuine and spurious, in man [this *Bulletin*, 1951, v. 48, 183]. They confirm the need for microscopists to keep the possibility of *Capillaria* infections in mind when they are examining human faeces and to make themselves familiar with the morphology of the eggs, which might be mistaken for those of *Trichuris*, and with their origin, which is commonly mechanical conveyance by food. *H. J. O'D. Burke-Gaffney*

See also p. 1066, Perez-Santiago *et al.*, **The Effect of a Cyanide Dye on Infections with Hookworm and** *Trichuris* **in Man.**

HAEMATOLOGY

van Oye, E. L'anémie dans la malnutrition et dans la dénutrition (= kwashiorkor) en Afrique centrale. [**Anaemia in Malnutrition and Kwashiorkor in Central Africa**] *Inst. Roy. Colonial Belge Bull. des Séances.* 1953, v. 24, No. 2, 632–68, 2 figs. [42 refs.]

This is a paper which discusses—rather than presents scientific evidence on—the nature of the blood picture in kwashiorkor. The number of patients investigated is not given and one can only gather that the majority were

children between 2 and 8 years of age, and that 1 infant aged one year and 3 adolescents and 3 adults were also seen. In view of his very sweeping conclusions it is a pity that the author states that "*pour autant que possible nous nous abstiendrons d'entrer dans les détails cliniques de ces cas*". There is not only a return to dimorphic anaemia but indeed to a "trimorphic anaemia". There have always been 2 types of dimorphic anaemia, one in which there were macrocytic hypochromic cells said to show deficiency of iron and of liver factor and one in which there were two different cell populations when a microcytic anaemia was treated with iron. The author does not accept the interpretation of these two phenomena as being the outcome of reticulocytosis and as he now finds cases in which there are three peaks in the diameter distribution curve of red cells in some patients—representing microcytic, normo- and macrocytic cell populations—he proceeds to describe an anaemia of trimorphism due to liver disease, denutrition and malnutrition.

The technical skill of the author can only be guessed at from the few experimental data given, which include the measurement of the erythrocyte diameter to 1/100,000 mm. and the determination of the serum protein fractions to 1 mgm. per 100 ml. The abstracter is taken severely to task for suggesting that reticulocytes and early postreticulocytes are the cause of macrocytosis in the anaemia of adults investigated by him in Uganda, and for claiming that this reticulocytosis was produced by a bone-marrow working under stress in an attempt to compensate for peripheral blood destruction. There are many ingenious arguments refuting these findings—which were incidentally made on patients not at all suffering from kwashiorkor; no account, however, is taken of the experimental fact that in these patients reticulocytosis and high MCV both disappeared on curing the condition which caused the peripheral blood destruction, which usually was ankylostomiasis. *H. Lehmann*

PIETERS, G., VANDEPITTE, J. & VAN WYMEERSCH, H. A propos d'un cas d'anémie à hématies falciformes avec modifications radiologiques osseuses du crâne. [**A Case of Sickle-Cell Anaemia With Radiological Changes in the Bones of the Skull**] *Ann. Soc. Belge de Méd. Trop.* 1953, Apr. 30, v. 33, No. 2, 133–9, 4 figs. on 4 pls. [13 refs.]

VENOMS AND ANTIVENENES

GIBOIN, L. M. & DILLE, M. Premiers résultats de l'emploi au Togo du sérum antivenimeux lyophylisé du Haffkine Institute de Bombay dans l'envenimation par *Echis carinatus* Schn. [**The Use of Lyophilized Antivenin from the Haffkine Institute in Bites by** *Echis carinatus*] *Méd. Trop.* Marseilles. 1953, Mar.–Apr., v. 13, No. 2, 191–7.

SALOU and the senior of the authors of the present article have reported on the seriousness and fatality of bites by *E. carinatus* in Sodoké, North Togo [see this *Bulletin*, 1952, v. 49, 442, 443]; and the former stressed the inadequacy of the A.O. antivenin [presumably *Afrique occidentale*; it is anti-*Bitis* and *Bungarus*] obtained from the Pasteur Institute. In consequence, the authors considered obtaining an antivenin against *Vipera russelli* which was supposed to be active against *E. carinatus* venom. They were, fortunately, able to get an antivenin from the Haffkine Institute,

Bombay, prepared from *Naja tripudians*, *Bungarus caeruleus*, *V. russelli* and *E. carinatus*. One cc. of this, concentrated, and injected intravenously, would neutralize the following amounts of venom in dried form: *N. tripudians* 0·6 mgm., *B. caeruleus* 0·45 mgm., *V. russelli* 0·6 mgm., and *E. carinatus* 0·45 mgm. The antivenin is lyophilized, and in the dried state is readily soluble in water, even after being kept for long periods; it maintains its efficacy, without being kept on ice, though it is better to do so if the period of keeping is very prolonged, and it is claimed that "under the best conditions the potency is retained for 10 years" [abstracter's translation]. It is put up in ampoules containing enough dried serum to give 10 cc. of the liquid antivenin in doubly distilled water.

The authors were able to acquire only a limited amount of the antivenin and therefore they kept it for special cases in which the offending snake was almost certainly *Echis carinatus*, for many practitioners mistake species of *Causus* (*C. rhombeatus*) and *Bitis* for *E. carinatus*. They give brief notes of 15 patients to whom they gave the antivenin intravenously and intramuscularly in doses of 10–30 cc., repeated or not according to the severity of the symptoms and the length of the interval after infliction of the bite. Only one of the 15 died; a man of 60, bitten by a large snake on his finger and seen 15 hours later. He died 12 days after being bitten. The authors suggest giving larger doses, 60 cc., intravenously. If this is not available the A.O. serum may be tried, but larger doses are needed, 200 cc. or more, and the proportion of cures is smaller. They add a note to the effect that mechanical suction should be employed in all cases until the antivenin is available and Lindbergh [no reference given] has recorded that in the Deccan, where *Echis* abounds, "many recover from the bites even without antivenin, if suction is carried out early and thoroughly, after incisions" [abstracter's translation]. [This would seem rather to detract from the good claims made for the use of the antivenin by the authors.]

H. Harold Scott

Witham, A. C., Remington, J. W. & Lombard, E. A. **Cardiovascular Responses to Rattlesnake Venom.** *Amer. J. Physiol.* 1953, June, v. 173, No. 3, 535–41, 2 figs. [20 refs.]

DERMATOLOGY AND FUNGUS DISEASES

Morgan, R. J., Shackleford, P. O. & Lamb, J. H. **Unusual Forms of Solar Dermatitis.** *Arch. Dermat. & Syph.* 1953, Apr., v. 67, No. 4, 369–78, 3 figs. [Refs. in footnotes.]

Three examples of light-sensitive eruptions were reported. The first patient was a rancher aged 37 whose photosensitivity developed when he was 7 years old. Lesions passed through the stages of papule, ulcer and scar, occurring on the face, neck, hands and arms. There was decreased libido with a low sperm count and scanty pubic and axillary hair. His liver was large, smooth but not tender. No "uroporphyrins or porphobilinogen" were found in the urine, and the 17-ketosteroids averaged 8·48 mgm. in 24 hours.

Some improvement followed treatment with chorionic gonadotropin, 375 international units daily for five months, but the development of ascites necessitated laparotomy at which the hepatic cirrhosis was confirmed. He died of haemorrhage from eosophageal varices six months later.

The second patient was an oil worker aged 26 with photosensitivity since the age of 5. Two sisters were also affected. There was verrucose crusting and exaggerated skin markings on the ears, backs of the hands and the bridge of the nose. The sperm count was reduced. No uroporphyrins or porphobilinogen were found in the urine, and the 17-ketosteroids averaged 12·29 mgm. in 24 hours. No improvement followed treatment with gonadotropin.

The third patient was a lake custodian aged 45, who developed hypersensitivity to sunlight three years previously. His lesions consisted of erythema, nodules and plaques on face and hands. He was an alcoholic with a low sperm count and decreased libido.

Microscopically the chief characteristics of the lesions in all three patients were basophilic degeneration and homogenization of connective tissues.

In all three patients there was some evidence of liver damage which was proved at laparotomy on Case 1. The normal liver inactivates circulating steroids and thus indirectly controls the release of tropic hormones from the pituitary. In liver damage the circulating oestrogens are increased and the production of pituitary follicle-stimulating hormone is inhibited. Similarly, failure of androgen inactivation may lead to increased production of oestrogen and depression of pituitary-follicle-stimulating hormone, while large amounts of circulating androgen can depress the germinal epithelium to arrest spermatogenesis.

The rôle of steroids in maintaining connective tissues and ground substance and their relationship to melanogenesis are discussed in detail. The importance of trace elements, particularly fluorine, on enzymal reactions is considered, also the association between vitamin C and the synthesis and maintenance of collagen. *H. T. H. Wilson*

CUMMINS, C. R., BAIRSTOW, B. & BAKER, L. A. **Stilbamidine in Treatment of Disseminated Blastomycosis. Report of Two Cases.** *Arch. Intern. Med.* 1953, July, v. 92, No. 1, 98–107, 5 figs.

The successful use of stilbamidine for the treatment of North American blastomycosis (*Blastomyces dermatitidis*) has been described, with details of the methods of administration, by SCHOENBACH *et al.* [*Bull. of Hygiene*, 1952, v. 27, 61, 1112] FINK *et al.* [this *Bulletin*, 1953, v. 50, 758] and PARISER *et al.* [*Bull. of Hygiene*, 1953, v. 28, 821].

The present report deals with the treatment of 2 cases of the disease with this diamidine. The first patient, a 39-year-old man of Mexican descent, suffered from a pneumonic condition of the upper lobe of the right lung, with haemoptysis, fever, night sweats and some loss of weight. Treatment with penicillin and aureomycin, followed by chloramphenicol and dihydrostreptomycin and then by streptomycin and PAS proved ineffectual. On suspicion of carcinoma, thoracotomy was performed and the entire right upper lobe excised. Histological examination of the lung tissue showed an extensive fibro-granulomatous change which was not, at the time, identified as blastomycotic. Post-operative treatment with penicillin, terramycin [oxytetracycline] and potassium iodide was given.

The development of a granulomatous lesion on the skin of the face led to the mycological diagnosis of blastomycosis, and a review of the sections of lung tissue revealed the presence of *B. dermatitidis*. Other lesions occurred on the scapular region, in the prostate and in the right 5th toe, but no new lesion was detected in the lungs. Treatment with the antibiotics and iodide was repeated and it appeared to cause some regression of the

lesions. After a month, treatment with stilbamidine was commenced with 50 mgm. intravenously each day for 2 days, then 100 mgm. daily for 2 days and finally 150 mgm. daily up to the end of 18 days. Neomycin was applied locally to the lesions. This treatment resulted in apparent cure, and an examination made 3 months later showed no sign of recurrence.

The second patient, a man aged 49, suffered from blastomycotic osteomyelitis of the foot which necessitated amputation; there was also involvement of the prostate and a bilateral granular type of infiltration of the lungs. Later, he became febrile and numerous cutaneous abscesses developed. The symptoms subsided under treatment with chloramphenicol, but recurred despite continued treatment. An acute exacerbation occurred with high fever, anorexia, and multiple dermal lesions and subcutaneous abscesses. At this stage, he was given a course totalling 2·12 gm. of stilbamidine which brought about apparently complete clinical recovery. A few weeks later, however, urinary retention occurred and *B. dermatitidis* was found to be still present. A further course of 1·8 gm. stilbamidine was given and the patient will be kept under observation for a further period.

No toxic effects were caused except trigeminal neuropathy, which occurred in both cases. *J. T. Duncan*

TOWNSEND, T. E. & MCKEY, R. W. **Coccidioidomycosis in Infants.** *Amer. J. Dis. Children.* 1953, July, v. 86, No. 1, 51–3.

"A case of disseminated coccidioidomycosis in a 3-week-old infant with death at two months is reported. The disease may be found at any age and appears to be quite fulminating during infancy. Some unusual findings are reported."

GOODMAN, J. R., FOUNTAINE, Joan & VINCENT, J. **Cooling of Embryonated Eggs to produce an LD_{50} for** *Coccidioides immitis.* *Proc. Soc. Exper. Biol. & Med.* 1953, June, v. 83, No. 2, 360–62.

For the purpose of measuring the lethal effect, on animals, of experimental inoculations with living pathogenic organisms, the LD50 formula is frequently used. This method, however, may be difficult to apply in the case of infections which do not yield fatal results within a relatively short time.

The rabbit and the guineapig have been found unsuitable for the LD50 of *Coccidioides immitis*, because of the variable results following inoculation, but the chick embryo in the incubating egg presents a more promising subject for these tests. However, even massive doses of a million spores of *C. immitis* inoculated into the allantoic sac may not always cause the death of the embryo, and, in order to depress its resistance to infection, various means have been used such as exposure to X-rays and injection of toxic chemicals. The present authors found the simple expedient of cooling the 8-day-old embryo to about room temperature, more feasible.

Eggs incubated in the ordinary way at 38·5°C. for 8 days and then cooled for 24 hours to about 22°–24°C. before incubation is restored, will still hatch on the 21st or 22nd day. In the present experiments, the eggs were cooled to 26°–27°C. on the 9th day, drilled, inoculated and sealed and restored to incubation on the 10th day. The results of these tests showed that by reducing the embryo's resistance, through transient cooling, the fungus was enabled to establish a parasitic foothold, and the mortality rate of the embryos made it possible to determine the LD50 dosage by the Reed-Muench formula. By the use of graduated inoculations, the LD50 for *C. immitis* was found to be 3,500 spores when inoculated into the cooled

embryos, whereas 3 separate doses of 1×10^6 spores each on 3 different days, inoculated into embryos which had not been cooled, produced no significant fatalities. Control tests of inoculation with heat-killed suspensions of *C. immitis* on cooled embryos also caused no significant mortality.

The technique offers many advantages in cheapness, ease of control and flexibility, but account should be taken of factors affecting the rate of hatching in the batch of eggs used, which may vary with different strains of chickens and in different areas. The age and state of nutrition of the mother hen and the stage of her egg-laying season may also affect the hatching rate. *J. T. Duncan*

DE CARVALHO, A. Sôbre o emprêgo da paracoccidioidina na cidade do Rio de Janeiro. (Primeiros resultados baseados no estudo de 475 indivíduos.) [**On the Employment of Paracoccidioidin in the City of Rio de Janeiro. Primary Results Based on the Study of 475 Individuals**] *Rev. Brasileira Tuberculose.* Rio de Janeiro. 1953, Jan.–Feb., v. 21, No. 145, 73/82.

Advantage was taken of the facilities offered by the Dispensary-School National Tuberculosis Service, to conduct a survey by means of the tuberculin, histoplasmin, paracoccidioidin and coccidioidin skin tests, with mass radiography of the chest, on 475 persons in the city of Rio de Janeiro. The 475 persons comprised 288 males (204 white and 84 coloured) and 187 females (117 white and 70 coloured); 230 were children (age 0 to 12 years), 75 were adolescents (13 to 17 years) and 170 were adults (18 years and over). Clinically, 353 of the subjects were normally healthy, 31 (6·5 per cent.) had residual pulmonary lesions and 91 (19·2 per cent.) had active pulmonary disease—tuberculosis or some other infection.

There were high reactor rates to the tuberculin test, reaching the maximum of 92·9 per cent. in the adult group. The histoplasmin test, which was performed on 425 people, showed reactor rates of 2·9 per cent. in the children, 17·6 per cent. in the adolescents and 32·9 per cent. in the adults. The test with paracoccidioidin at a dilution of 1:10 showed no reactors among the children, 6·7 per cent. among the adolescents and 8·8 per cent. among the adults; when the test was made with paracoccidioidin at 1:100 the corresponding proportions were 2·7 per cent. and 3·5 per cent. Definitely higher reactor rates to paracoccidioidin were found among males than among females, and the author considers that this may be due to the influence of a hypothetical sex factor [the undoubted influence of occupation on the infection rate in paracoccidioidal disease should, however, be taken into account]. The coccidioidin test, which was performed on only 95 people, with coccidioidin at 1:100, showed reactor rates of 8·6 per cent., 5·9 per cent. and 10 per cent. in children, adolescents and adults respectively.

Of the 91 people with active pulmonary disease, 6 were proved to be cases of pulmonary paracoccidioidomycosis and 3 others were suspected cases. The 6 proved cases were all in adults; 5 being of middle age. Four of the 6 cases were of the tegumento-visceral type and 2 of these were clinically grave but the other 2 were in the stage of recovery. One of the remaining cases was of an inapparent pulmonary type of moderate severity and the other of the grave disseminated type. *J. T. Duncan*

TROPICAL OPHTHALMOLOGY

SORSBY, A., UNGAR, J. & CRICK, R. P. **Aureomycin, Chloramphenicol, and Terramycin in Ophthalmology.** *Brit. Med. J.* 1953, Aug. 8, 301–4.

The place of the sulphonamides and of penicillin in ocular infections mainly due to Gram-positive organisms, and of streptomycin in infections mainly due to Gram-negative organisms, is now well established. None of these agents has, however, proved of much use in virus infections (dendritic ulcer, disciform keratitis, epidemic keratoconjunctivitis and herpes ophthalmicus), except that the sulphonamides are valuable in the treatment of trachoma and in inclusion blennorrhoea, with penicillin almost as effective in the latter infection. Aureomycin, chloramphenicol and terramycin administered systemically do not penetrate readily into the eye, so that adequate intra-ocular therapeutic levels are not obtained by such administration.

In the work now recorded, aureomycin was used in the form of ointment 1 per cent. or subconjunctival injection of 10 mgm.; terramycin was used in the form of 0·5 per cent. ointment; chloramphenicol was used in the form of 1 per cent. ointment, 0·5 per cent. drops or subconjunctival injection of 0·5 ml. of 15 per cent. solution.

It was found that aureomycin was of little value in ophthalmology; terramycin was useful in ointment form for epidemic keratoconjunctivitis, and chloramphenicol gave results as good as or better than terramycin in epidemic keratoconjunctivitis. Of these three antibiotics, chloramphenicol is the only one which can be used in a relatively high concentration subconjunctivally; it may be of value in the occasional cases of intra-ocular infection due to organisms sensitive to chloramphenicol but insensitive to the sulphonamides, to penicillin or to streptomycin.

Apart from the control of epidemic keratoconjunctivitis by both terramycin and chloramphenicol, the virus diseases of the eye still remain a therapeutic problem. *E. W. O'G. Kirwan*

HEAT STROKE AND ALLIED CONDITIONS

ELLIS, F. P., SMITH, F. E. & UNDERWOOD, C. R. **Effect of Upper Deck Temperature on the Health of Men in Ships of the Royal Navy.** *Brit. J. Preventive & Social Med.* 1953, Apr., v. 7, No. 2, 69–75, 4 figs.

The authors have analysed for another year (1st October, 1948, to 30th September, 1949) the special sickness returns introduced in 1946 (ROBERTS, *Brit. J. Social Med.*, 1948, v. 2, 55). The percentages of persons sick and on the attending lists in 77 Royal Naval ships (282,000 man months) are tabulated in five groups: (1) Upper respiratory infections; (2) Dysenteries and diarrhoea; (3) Skin diseases; (4) Injuries and accidents; and (5) All other diseases, for mean upper deck environmental temperatures from 30° to 100°F.

There was little change in the sick list whatever the outside temperature, but the attending list increased gradually up to 80°F. upper deck temperature, rose more sharply between 80° and 90°F., and above 90°F. showed a striking rise. This rise was mainly due to "skin diseases" although "injuries and accidents" and "other diseases" also showed a marked increase above 90°F.

The most definite rises in mean percentage of ships' companies on the

attending list occurred in sloops (2·66 per cent.) and cruisers (2·01 per cent.), although all classes of ships for which adequate data were available showed an upward trend above 80°F. upper deck temperature.

The Malayan area was the warmest and least healthy with 7·4 per cent. and 1·1 per cent. respectively of cases on the attending and sick lists. At the cooler extremes the Home Fleet (3·14 and 0·77 per cent.) and Mediterranean Fleet (3·24 and 0·49 per cent.) were almost equally healthy.

It is concluded that, although other factors are responsible, the incidence of skin diseases affords a useful guide to the effect of undesirably warm humid conditions on health. *M. L. Thomson*

See also p. 968, Shelley, **Miliaria.**

TROPICAL ULCER

Bogaert, W. Les sympathectomies et l'ulcère phagédénique tropical. [**Sympathectomy in Tropical Ulcer**] *Ann. Soc. Belge de Méd. Trop.* 1953, Apr. 30, v. 33, No. 2, 99–106.

The author has attempted by surgical intervention to reduce the long period of treatment necessary for the cure of tropical phagedaenic ulcer. The first step was to clean up the ulcer by vigorous curetting away of all necrotic tissue, which was done under spinal anaesthesia. During the next 2 or 3 days the ulcer was dressed with an ointment of sulphonamide (5 per cent.) and penicillin 200,000 units in 100 gm. of cod-liver oil. When granulations appeared, the ulcer, after light curetting, was skin grafted and dressed with the same ointment. This method gave quicker recovery than medical treatment alone, but the tissues were so badly nourished that healing was very slow, so some method of improving the blood supply was sought. The injection of vasodilators (*e.g.*, acetylcholine) had to be carried to the limit of tolerance and required more supervision than the medical staff could give. Repeated spinal anaesthetics were inconvenient and frequently caused headache. The intra-arterial injection of 1 per cent. novocaine was found to be very efficacious, but the puncture of the adventitia causes contraction of the artery and if the wall of the vessel has not been completely penetrated at the first attempt repetition is difficult. Repeated infiltration of the lumbar sympathetic on the affected side is an excellent proceeding, but needs the constant attention of the medical officer.

The author therefore adopted the method of peri-arterial sympathectomy over a section of the femoral artery 8–10 cm. long. This procedure was followed immediately by curetting, with grafting some days later. The author found, however, that in the case of large ulcers, healing, after a period of activity, was apt to slow up and stop. He therefore performed lumbar sympathectomy by the extraperitoneal approach in about 50 cases, the result of which was that the mean period from operation to complete healing was reduced to 8 weeks, against 3 months for similar cases treated by peri-arterial sympathectomy. Later the author tried immediate grafting followed by curettage, with application of plaster of Paris for 12 days, or longer if necessary. Healing was complete in a mean of 24 days for medium-sized ulcers treated by peri-arterial sympathectomy and 28 days for large ulcers (over 6 cm.), for which lumbar sympathectomy was performed and is recommended. Even small ulcers, less than 5 × 5 cm., treated by

simple curettage, with or without grafting, require longer periods than these for healing. Brief notes are given of 23 cases treated by the various methods. *W. L. Harnett*

MARCOTORCHINO, J. D., MÉAR, Y. & COURSON, B. Du traitement des ulcères phagédéniques par les greffes et en particulier par les greffes pédiculées. [**Treatment of Tropical Ulcer by Skin Grafts, Especially Pedicle Grafts**] *Méd. Trop.* Marseilles. 1953, May–June, v. 13, No. 3, 328–36, 8 figs. on 4 pls. [10 refs.]

MISCELLANEOUS DISEASES

NAVARRANNE, P., PARIS, P. & CAMAIN, R. Note sur l'appendicite en milieu africain. [**Appendicitis in Africans in Dakar**] *Bull. Méd. de l'Afrique-Occidentale Française.* 1952, v. 9, No. 2, 309–14.

The authors present the results of 32 months' observation of clinical and pathological findings in appendicitis in Africans at two hospitals in Dakar, one for the indigenous population and the other for officials and soldiers, living under conditions permitting regular medical supervision.

In the first group only 59 cases of appendicular disease were seen among 10,752 admissions to hospital (0·5 per cent.). Of the 59 cases 34 per cent. were acute uncomplicated, 3·4 per cent. had abscess and 34 per cent. had acute general peritonitis; in 3 cases ova of *S. haematobium* were found in sections of the removed appendix. Attention is drawn to the advanced stage of the disease and high percentage of general peritonitis, the poor general condition and the high incidence of paralytic ileus.

At the other hospital during the same period 49 cases of appendicitis were seen among 2,066 admissions (2·3 per cent.). Of these cases 30·5 per cent. were acute uncomplicated, 16·3 per cent. had abscess and only 2 per cent. had general peritonitis, because patients were usually seen and sent to hospital before the development of major complications.

The authors present findings of the condition of the appendix in 50 autopsies on Africans who had died from non-abdominal conditions. The appendix was found to be longer than in Europeans, was retro-caecal in 20 per cent. of cases and attached to the parietal peritoneum by a non-vascular mesentery in 30 per cent. They found evidence of former appendicitis, in the shape of adhesions more or less dense between the appendix and surrounding organs, in 66 per cent., and on microscopical examination 60 per cent. were found to show evidence of subacute inflammation in the wall of the appendix and similar changes in the lymph nodes draining the area; in some cases the walls of the appendix were fibrotic. There were 4 cases in which ova of *S. haematobium* were found in the submucosa and 5 in which, apart from inflammatory lesions, *Enterobius* was present in the lumen.

The authors consider that the African is predisposed to appendicitis by the prevalence of local inflammatory conditions — colitis, helminthiasis, amoebiasis — and that the contrast between the infrequence of obvious clinical appendicitis and the frequence of histological evidence of the disease at necropsy is due to the occurrence of a great number of attacks of appendicitis being unrecognized, or sometimes mistaken for amoebiasis. Consequently the patients do not come to hospital in the early stages of an attack, when operation is easy, but are seen late when complications have supervened. *W. L. Harnett*

PROTOZOOLOGY: GENERAL

STITT, Pauline G. & LEVINE, M. **The Possible Existence of Clinical Toxoplasmosis in Hawaii.** *Hawaii Med. J.* 1953, May–June, v. 12, No. 5, 351–4. [Refs. in footnotes.]

The authors briefly survey the history of knowledge of human toxoplasmosis and emphasize the value of the dye test of Sabin and Feldman in diagnosis. Reference is made to the high incidence, noticed by ophthalmologists, of chorioretinitis in children in Hawaii. Physicians there were invited to submit clinical notes, radiological reports, and specimens of blood serum from patients (and their mothers in the case of children) who had an ophthalmological or central nervous system defect of obscure origin in which congenital toxoplasmosis might be considered in differential diagnosis. As a result 29 cases were considered suitable for detailed study. The toxoplasma dye test was carried out on the sera in Dr. Feldman's laboratory, and the dye test titre is described as the highest dilution of a test serum which, when in contact with toxoplasma from mouse peritoneal exudate in the presence of an adequate amount of a complement-like "accessory factor", renders the cytoplasm of 50 per cent. of the extracellular toxoplasma unstainable with alkaline methylene blue. In tabular form it is shown that the dye test was negative in 14 patients who had no chorioretinitis. Sera from 11 mothers of children among these negative cases were also negative with one exception who had a test positive to a titre of only 1 in 64. The remaining 15 patients all had chorioretinitis and 14 of these had dye test titres of 1 in 4 or more. Seven of the patients had titres within the range 1 in 256 to 1 in 1,024. The sera from 12 mothers of children among these positive cases gave 11 positive dye tests. Thus there is demonstrated serological evidence of toxoplasmosis in Hawaian mothers and children where the child has chorioretinitis. The authors suggest that further investigations should be continued in Hawaii, particularly in view of the possible development of effective drug treatment. *S. Bell*

AMERICAN J. TROP. MED. & HYG. 1953, May, v. 2, No. 3, 360–444. **Symposium on Toxoplasmosis [i] Toxoplasmosis: Current Status and Unsolved Problems.** Introductory Remarks (SABIN, A. B.) 360–64, 14 refs; [ii] **The Biology of** *Toxoplasma* (JACOBS, L.) 365–89, 5 figs. & numerous refs.; [iii] **Host, Strain and Treatment Variation as Factors in the Pathogenesis of Toxoplasmosis** (FRENKEL, J. K.) 390–415, 17 figs. & 41 refs.; [iv] *Toxoplasma*-**Like Protozoa in Chorioretinitis in Adults** (WILDER, Helenor C.) 417–19, 5 figs.; [v] **The Clinical Manifestations and Laboratory Diagnosis of Toxoplasmosis** (FELDMAN, H. A.) 420–28, 4 figs. & 22 refs.; [vi] **The Present Status of the Chemotherapy of Toxoplasmosis** (EYLES, D. E.) 429–44, 3 figs. & 30 refs.

(i) Only one species of *Toxoplasma* is valid—*T. gondii*—and diagnosis is made on the following considerations:—

1. Stained impression films show the typical morphology.
2. Pathogenicity exists for a variety of animals.
3. The parasite is an obligatory intracellular organism.
4. Cross immunity occurs.

On the basis of these criteria, *Toxoplasma* has been recovered from man, guineapigs, hares, dogs, swine and pigeons.

The use of serological reactions in human infections is discussed and it is emphasized that there is only one acceptable index of acute infection—the absence of complement-fixing antibody at a time when the cytoplasm-modifying antibody (in the dye test) is rising to high levels. In surveys it is found that positive serological reactions increase with age, and in certain places 50 per cent. or more of the population are positive after the age of 20 years. If these reactions are true indicators of infection, then there must be millions of people in the world who are infected with the organism; the author wonders how many of these exhibit symptoms which remain at present unrecognized. Similarly in domestic animals, the rôle of infection is little understood. There may well be, however, a great deal of infection and very little disease.

(ii) This paper gives a useful summary of the morphology, viability, maintenance, strain differences, immunological characters, latency and epidemiology of *Toxoplasma gondii*, a parasite found naturally in the gondi, mouse, vole, rat, rabbit, guineapig, squirrel, marmot, dog, cat, chinchilla, sheep, swine, baboon, chimpanzee, man and pigeon.

The identity of certain parasites resembling *Toxoplasma* is questioned—"*T. microti*" of voles is thought not to belong to this genus, and a similar organism in *Peromyscus* is referred to as the "P organism" [hardly more satisfactory than miscalling it *Toxoplasma*]. The distinction between *Toxoplasma* and *Encephalitozoon* is clearly given. The presence of so-called *Toxoplasma* in reptiles remains unconfirmed, and attempts to infect amphibia and reptiles with *T. gondii* have always failed [but see below]. Discrepancies in the descriptions of infectivity in various hosts are very likely due to strain differences—it is often difficult to isolate the parasite from a wild animal into a different species of laboratory animal, owing probably to adaptation of the organism in specific hosts, and "blind passages" in the early subinoculations are often the preliminary to successful isolation. A useful method of preserving the original virulence is by maintenance in the chick embryo—strains have kept their same characters by this means for as long as 3 years.

Theories of transmission are discussed in detail, and the presence of the organism in all the dejecta, in most secretions and tissues of the body, renders the theoretical possibilities very numerous; however, the parasite soon dies, away from its host, and contact transmission in these ways seems improbable and in fact is shown rarely to occur in colonies of animals one of which is deliberately infected. There is a good table giving the records of transmission experiments with arthropods—nearly all negative except for Giroud and Le Gac's mite observations and the long survival of the organism in the louse and tick; in no case was transmission by bite obtained.

(iii) The pathogenicity of *Toxoplasma* is discussed in relation to species of host, strain of parasite, and immunity as modified by sub-curative treatment. It is pointed out that the first stage of infection is that of active proliferation of the organism accompanied by tissue destruction and antibody production, this is followed by formation of cysts with rigid walls, and finally during chronicity, the breaking down of cysts which sets free the organism into the body and thus maintains a high degree of premunition.

Two strains of *Toxoplasma* were employed—the RH and the CJ. These produced different types of lesions in mice, the RH giving rise to a disseminated and the CJ a localized infection (there is a useful table giving all the points of distinction). Hamsters and guineapigs are only slightly sensitive to the CJ strain and deer mice develop latent infection with premunition. Treatment of mice with sulphadiazine and sulphamerazine

enabled these animals to respond in a similar way—they became clinically cured, but parasites persisted and they stayed in this state of premunition. This effect was easy to attain in the case of the CJ strain—100 per cent. of the mice responding after 2 weeks' treatment; but in the case of the RH strain less than half were protected even after treatment for 85 days. In the latter mice the *Toxoplasma* became localized principally in the brain, lung, spleen and liver; in the eye in 35 per cent. of the animals; rarely in skeletal muscle, adrenals and testes. The organism persisted longest in the brain and lung, probably because of cyst formation and the inability of the drug to penetrate the thick cyst wall. In naturally infected pigeons the central nervous system is frequently involved; in artificial infections with the RH or CJ strains this was rarely the case, the parasite invading instead the bone-marrow, nasal passages, muscles, etc.

In contrast to most workers, Frenkel succeeded in obtaining infections in lizards and turtles, in which the organism persisted for as long as a month. *Amblyomma* ticks harboured *Toxoplasma* for 5 weeks after intra-coelomic inoculation of the parasite.

Five methods have been employed for the detection of the infection:—(1) isolation of the organism in clean mice or guineapigs according to the strain; several subinoculations may be necessary to reveal the infection, or cortisone may be employed; (2) challenge with a known strain, which is useful for determining the presence of chronic or latent infections, though cross-immunity is not always perfect; (3) serological data—especially the dye test with a rising titre; (4) dermal hypersensitivity—only applicable to man, monkey and guineapig; and (5) histological examination of tissue, where *Encephalitozoon*, *Sarcocystis*, "M-organism" and "P-organism" may require to be differentiated.

(iv) [See this *Bulletin*, 1953, v. 50, 65.]

(v) This paper provides a good summary of the author's views on the diagnosis of toxoplasmosis. He begins by stating that the isolation of the organism into laboratory-bred mice is the best method; combined intra-cerebral and intraperitoneal inoculations are used and continued in at least 3 blind passages (of brain or spleen emulsions) every fortnight. The dye test is not considered significant if the titre of the serum is below 1 in 16; this test becomes positive within 2 weeks of infection and probably remains so for most of life. Serial samples are essential for diagnosis of acute infection. The complement-fixation test does not become positive for about a month and disappears within 2 to 4 years. The history of a recent case illustrates these points: a 6-year-old boy had a mild fever with a maculo-papular rash which cleared up in 3 days; a week later he developed stupor and convulsions—his serum showed a titre of 1 in 1,024 in the dye test, rising to 1 in 4,096 a week later, and complement fixation in a dilution of 1 in 64. The mother's serum remained unchanged during this period at a titre of 1 in 64 to the dye test and negative to complement fixation. The child made a full recovery.

The signs of congenital toxoplasmosis in 103 cases were classified as follows: 99 per cent. showed chorioretinitis, 63 per cent. cerebral calcifications, 56 per cent. psycho-motor retardation, half had either hydro- or micro-cephaly and half had convulsive episodes. It is pointed out that, with a few exceptions (such as intestinal ulceration and diarrhoea in dogs), the manifestations of the disease are similar in man and animals.

The incidence of *Toxoplasma* antibodies in some domestic animals in the United States was as follows:—albino rats and cattle nil, rabbits 5 per cent., guineapigs 28 per cent., swine 30 per cent., cats 34 per cent., goats 48 per cent., and dogs 59 per cent. [If these reactions can be accepted as

proof of toxoplasmosis—and are not the response of the animal to some other organism—then the possibilities of man acquiring the infection must be unlimited.]

(vi) [See this *Bulletin*, 1953, v. 50, 568–569.] *P. C. C. Garnham*

COUTELEN, F., BIGUET, J., DOBY, J. M. & ST. DEBLOCK. Le problème des toxoplasmoses aviaires. Réceptivité variable de quelques oiseaux à une souche humaine de toxoplasmes. [**Avian Toxoplasmosis: Susceptibility of Various Birds to a Human Strain**] *Ann. Parasit. Humaine et Comparée.* 1953, v. 28, No. 3, 129–56. [Numerous refs.]

HUBER, H. Die geburtshilfliche Bedeutung der Toxoplasmose. [**The Obstetrical Importance of Toxoplasmosis**] *Med. Klin.* 1953, July 24, v. 48, No. 30, 1086–7. [43 refs.]

A short review of the literature.

MICHALZIK, K. *Trichomonas vaginalis* und positive Seroreaktion auf Toxoplasmose. [**Positive Serological Reaction for Toxoplasmosis in Infections with** *Trichomonas vaginalis*] *Deut. med. Woch.* 1953, Feb. 27, v. 78, No. 9, 307, 2 figs. [10 refs.]

The Sabin-Feldman dye test applied in the case of 50 adult women infected with *Trichomonas vaginalis* in Erlangen produced a positive reaction in 64 per cent. with a titre of 1 in 25. Similar results were obtained with the complement-fixation test (Westphal's method). Since these figures are considerably higher than those found for the general population by other observers, according to whom the incidence of toxoplasmosis in Germany varied from 2 to 20 per cent., it is evident that the serological tests for toxoplasmosis are not strictly specific, but may be positive in cases of vaginal trichomoniasis as well. In this connexion, it is pointed out that positive serological reactions for toxoplasmosis have previously been reported for animals infected with sarcosporidia and trypanosomes [see this *Bulletin*, 1952, v. 49, 320, 322]. *C. A. Hoare*

DOFLEIN-REICHENOW. **Lehrbuch der Protozoenkunde, Vol. 2, Part 1, Mastigophoren und Rhizopoden.**

This book is reviewed on p. 1109.

ENTOMOLOGY AND INSECTICIDES: GENERAL

See also p. 1003, BRISCOE, **The Relation of Insects and Insect-Borne Diseases to the Vegetation and Environment in Liberia.**

MORRIL, A. W., Jr. **Army Insect Control Operations in the Far East.** *J. Econom. Entom.* 1953, Apr., v. 46, No. 2, 270–76.

In recent years, the American forces in the Far East have been protected from insect pests by teams drawn from the Medical Service, the Corps of

Engineers and civilian entomologists. The areas involved include Japan, Korea, Okinawa, the Philippines and Guam.

Mosquitoes. The malaria vector in Korea, Okinawa and to a small extent in Japan, is *A. hyrcanus sinensis.* In the Southern Ryukyus, *A. minimus* and *A. ohami* are also vectors, somewhat replacing *A. h. sinensis* in population density. In the Philippines the primary vector is *A. minimus flavirostris.*

Apart from malaria vectors, *Aëdes albopictus* required attention as the vector of dengue in the Philippines, Saipan and, to some extent, in Okinawa, Japan and Guam. Antilarval control measures range from large-scale air spraying to the provision of small bags of DDT powder to be shaken from handkerchiefs by local rice farmers. The more spectacular measures were by no means the most efficient. Aerial spraying was effective only if low and slow-flying aircraft were used and piloted accurately. In the Philippines where the vector mosquitoes were breeding among tall grass, DDT spray was effective only after the grass had been burnt (though DDT dust was good at all times). In some enclosed valleys too small for access by aeroplanes, good control was obtained by a hand-cranked rotary duster operated from a helicopter. Heat-generated aerosols of different types were tried on several occasions; but were nearly always unsatisfactory. The establishment of *Aëdes albopictus* and *Anopheles subpictus* on Guam is thought to be due to excessive dependence on these fogging machines.

In addition to larvicidal measures, house spraying with DDT in kerosene was done at intervals of 2 to 3 months in most areas. Mess-hall screens were treated monthly.

The effectiveness of treatments was assessed by regular dipping by scouts and occasionally by the use of animal-baited traps.

Flies. Species of *Musca, Chrysomyia* and *Lucilia* were troublesome. *C. megacephala, C. bezziana* and *L. caesar* were especially difficult, since they bred in places not susceptible to good control and alighted directly on food or on the floor and so avoided residual insecticides. Wherever the army disposed of its own refuse (rather than via contractors) sanitary land fills were used and open or covered dumps were prohibited. It was noticed that adult flies tend to ride in great numbers on army vehicles; therefore all of these vehicles were regularly sprayed with 5 per cent. DDT in kerosene.

Miscellaneous insects. Mite carriers of scrub typhus were controlled by repellents. Blackflies, not carrying disease, but causing great irritation, were controlled by DDT emulsion sprayed into breeding streams. Beetles breeding in stored products, which caused psychological harm, were eradicated by cyanide fumigations followed by DDT dusting over the exterior. Termites were destroyed by blowing DDT (and later pentachlorphenol) powder into their tunnels. DDT was also used against ants and cockroaches.

Throughout the entire area, no evidence of insecticide resistance was discovered except for the lice in Korea. Several cases were reported, but on investigation these proved to be due to inefficient control measures.

J. R. Busvine

APPLEWHITE, K. H., KEEGAN, H. L. & HEDEEN, R. A. **Residual Effectiveness of DDT Sprays against Mosquito Breeding in Alaska.** *J. Econom. Entom.* 1953, June, v. 46, No. 3, 516–17.

"Larval mosquito collections made at Eielson Air Force Base, Alaska, in May 1951 indicated that mosquito breeding at that base was still

adversely affected by applications of DDT applied in previous years. Percentage of reduction in population was determined by comparing population count, in experimental plots with those in adjacent untreated areas. Larval counts made on 19–20 May, 1951 showed a reduction of 94·4 per cent on a 100-square-mile plot which had received 0·3 lb. of DDT per acre applied in three doses of 0·1 lb. each, in 1949. A smaller 25-square-mile plot which had received a total of 1 lb. of DDT per acre as a result of ten applications of 0·1 lb. each, applied in 1948, 1949 and 1950 showed a reduction of 99·9 per cent. All applications of DDT were made with a C-47 aircraft equipped with a spray boom." [See also this *Bulletin*, 1951, v. 48, 91.]

JONES, J. C. **Microanatomical Study of DDT-Moribund** *Anopheles quadrimaculatus* **Say.** *Science.* 1953, Apr. 24, v. 117, 452–3.

Since the action of DDT still remains obscure, it seemed advisable to make complete histological studies of all the tissues of an insect, at different stages of its life cycle, with and without DDT poisoning. The common malaria mosquito of south-eastern U.S.A., *A. quadrimaculatus*, was used for this investigation. Larvae, pupae and adults of each sex were exposed topically to large doses of *p,p'*-DDT, and when moribund (2 to 8 hours) were studied by examination of dissected living individuals and of sectioned fixed specimens. The fresh material was examined by microscope with and without phase-contrast. The fixed material was stained by Delafield's or Heidenhain's iron haematoxylin and counterstained with eosin.

The careful examination of 26 different kinds of tissue revealed no microanatomical changes in either cell or nuclear structure as compared with the controls. This absence of visible structural damage to tissues by DDT intoxication agrees with most observations in regard to vertebrates poisoned with this insecticide. *J. R. Busvine*

HADAWAY, A. B. & BARLOW, F. **Studies on Aqueous Suspensions of Insecticides. Part IV. The Behaviour of Mosquitos in contact with Insecticidal Deposits.** *Bull. Entom. Res.* 1953, July, v. 44, Pt. 2, 255–71 [19 refs.]

Field studies in various parts of the world have shown that residual deposits of DDT are irritating to mosquitoes and drive them out of treated houses, sometimes before they have acquired a lethal dose. This paper describes a laboratory investigation of the phenomenon, with various mosquitoes exposed to different deposits of DDT and other insecticides. Carefully prepared fine crystalline suspensions of various insecticides were sprayed on to mud blocks, wallboard and other surfaces, to give standard deposits. The mosquitoes were exposed, singly or in small groups, in perspex cylinders applied to the vertical treated surfaces; they were removed after timed contacts for 24-hour mortality counts.

The following series of tests were all done with female *Anopheles stephensi*. It was found that various commercial preparations of DDT or specially prepared suspensions of different crystal size, all caused about the same amount of irritation; *i.e.*, caused the first flight of mosquitoes in an average of 3 to 4 minutes. However, the subsequent mortality differed greatly according to the type of deposit, being greatest with finer crystals. As the deposits aged, the crystals gradually became absorbed into mud

blocks (smallest ones going first) and this was reflected in delayed irritation response and absence of mortality.

A single commercial DDT preparation was applied at 100 mgm. sq. ft. to the following surfaces: mud blocks, wallboard, unpainted wood and glass. The speed of irritation was very similar in all cases (2·4 to 3·5 minutes), but the mortality was higher with the absorbent surfaces than with the wood and glass (to which crystalline suspensions tend to adhere strongly).

A series of 15 compounds analogous to DDT were tested for their irritant and insecticidal effects, when applied to wallboard at 100 mgm. sq. ft. Several compounds were irritant and some of them caused mortality; but there was no clear relation between these two effects or with solubility in paraffin or with crystalline form.

Some experiments were done with different residual insecticides. A residue from a DDT wettable powder was compared with others from similar preparations of BHC and dieldrin, all at 100 mgm./sq.ft. The DDT caused first flight in 3·6 minutes, the BHC in 1·3 minutes and the dieldrin in over 30 minutes.

The DDT exposure caused only 70 per cent. kill, but both the BHC and the dieldrin caused 100 per cent. mortalities. Further studies were made of BHC preparations. It was found that contact with freshly prepared deposits caused rapid irritation response. But contact with old deposits (with surface crystals evaporated or absorbed) or close apposition to fresh deposits without actual contact, would cause high mortality without irritation. From this it was concluded that contact with crystals of BHC would cause irritation (and usually a high kill), but the vapour of *gamma* BHC is lethal without causing irritation. Tests with α, β, γ and δ isomers of BHC showed that both the γ and δ caused irritation but only the former was insecticidal.

Comparative tests were made with insecticides of the chlordane type, including α-chlordane, aldrin, dieldrin, endrin and isodrin. When applied to wallboard at 100 mgm./sq.ft. all were slow to cause irritation flight but all gave complete kills.

Tests with other species of mosquito

When *Aëdes aegypti* females were exposed to the same series of deposits of DDT crystals on wallboard as the *A. stephensi*, they showed about the same speed of reaction to irritation. But the kills produced by the finer crystals were higher, probably because *Aëdes aegypti* walks about more, whereas *A. stephensi* remains still until irritated into taking flight.

Some tests were done with 4 species of mosquitoes, all after one blood meal, exposed to wallboards sprayed with different insecticides. The following table summarizes the results:—

	Mean time to first flight (mins.)			Percentage kill		
	DDT	BHC	dieldrin	DDT	BHC	dieldrin
A. stephensi ..	3·6	1·3	>30	70	100	100
A. gambiae ..	2·4	0·7	26	53	100	100
A. quadrimaculatus	3·3	0·5	25	60	100	100
C.p. molestus ..	1·8	0·9	>30	0	100	100

The reaction of all species approximate to that of *A. stephensi* to fresh deposits of DDT, BHC and dieldrin. The high resistance of the culicine *Culex pipiens molestus* to DDT is noteworthy. *J. R. Busvine*

ASCHER, K. R. S. & REUTER, S. **The Physical State and Insecticidal Properties of DDT in Spraying Residues. Laboratory Experiments on Glass Plates.** *Riv. di Parassit.* Rome. 1953, Apr., v. 14, No. 2, 115–22. [16 refs.]

It is well known that the crystallization of DDT reduces the contact toxicity of this insecticide. The toxicity of various preparations of DDT to which substances preventing crystallization have been added were tested against *Culex molestus*. Samples of female mosquitoes 24 hours old were exposed for 5 minutes to rough or smooth glass surfaces which had been sprayed with the insecticide, and then kept at 40°C. for 48 hours. After exposure the mosquitoes were transferred to clean cages and observations were made at intervals over 24 hours.

The mosquitoes were almost unaffected by crystalline deposits of DDT at 1·0 gm. per sq. metre, or lindane at 0·1 gm. per sq. metre. A slightly higher knock-down was achieved with chlordane at 0·2 and 0·4 gm. per sq. metre.

DDT applied with chlordane in kerosene solution at the rate of 0·4 gm. per sq. metre in the ratio of 1 part DDT to 3 parts chlordane, or in the ratio of 1:7, gave 30 per cent. and 80 per cent. knock-down respectively after 24 hours.

To prevent the volatilization of chlordane and therefore the crystallization of DDT, white paraffin oil was added to the mixture. If the percentage of paraffin oil added to the DDT-chlordane mixture was reduced from 5 to 2·5 per cent. the insecticidal action was reduced by only a small amount, provided that the DDT/chlordane ratio did not exceed the solubility of DDT in chlordane. The adjuvant properties of paraffin oil are thought to be due to the reduction of the volatility of the chlordane as well as to the improved sticking properties of the formulation. *C. Mary Harrison*

GJULLIN, C. M., ISAAK, L. W. & SMITH, G. F. **The Effectiveness of EPN and some other Organic Phosphorus Insecticides against Resistant Mosquitoes.** *Mosquito News.* 1953, Mar., v. 13, No. 1, 4–7.

DDT and other chlorinated hydrocarbon insecticides have failed to control larvae of *Culex tarsalis* and *Aëdes nigromaculis* in several parts of the San Joaquin valley of California. These organic phosphorus insecticides were compared with DDT for effectiveness against resistant larvae of the 4th instar, collected in Kern county. The dose of EPN [ethyl-p-nitrophenyl thionobenzene] necessary to give an LD50 of *C. tarsalis* larvae was 0·000649 p.p.m. and this insecticide was 67 times as toxic as DDT. EPN proved to be 171 times more toxic than DDT against larvae of *A. nigromaculis*, the LD50 being 0·000862 p.p.m. Both Malathon and tetra-n-propyl-dithionopyrophosphate were more effective than DDT against larvae of *C. tarsalis*. The latter insecticide, however, was not as efficient as DDT against *A. nigromaculis*. The toxicity of the 3 phosphorus insecticides to *C. tarsalis* larvae increased with an increase in temperature from 70°F. to 90°F.

EPN emulsions applied to irrigated pastures at 0·035 lb. of insecticide per acre gave 99 and 100 per cent. kills. Malathon and tetra-n-propyl-dithionopyrophosphate were approximately one-tenth as effective as EPN. Routine applications of emulsions at 0·075 lb. of EPN per acre from jeeps and from one aircraft in July and July, 1952, gave an excellent control of larvae. These phosphorus insecticides are cholinesterase inhibitors. Blood tests taken at intervals of 2 weeks on 4 men taking part in the spraying

operations showed no significant reduction in the cholinesterase level of the red cells or plasma during the season. EPN has one-fifth the acute oral toxicity of parathion but Malathon and tetra-n-propyl-dithionopyrophosphate have both low acute oral and dermal toxicities compared with EPN. Cattle grazed on pasture sprayed 6 times at 6–10-day intervals with EPN at 0·075 lb. per acre showed no adverse effects. [Nowhere in the text is the name of "EPN" given. This use of initials only for any but the commonest substances is confusing and to be deprecated.]

C. Mary Harrison

CHARLES, L. J. **Re-Infestation Problems in an *Aedes aegypti*-Free Area in British Guiana.** *West Indian Med. J.* 1953, Mar., v. 2, No. 1, 1–10, 2 text figs. & 2 figs. on pl. [13 refs.]

Aëdes aegypti was eradicated from Georgetown, British Guiana, by routine residual DDT spraying by 1947. Zero indices continued to be recorded until a focus of reinfestation came to light in June, 1951. The origin was almost certainly the escape of three adults from the office of the Mosquito Control Service in November, 1950; 11 larval foci were found in water containers in that area. Eight months after the original escape dissemination had extended from one city block to another, to span a maximum distance of less than 440 yards. These observations indicated that the rate of spread of *Aëdes aegypti* from an initial focus is slow enough in an unsprayed district of Georgetown to justify an annual inspection cycle for all premises. In other words, adequate control can be maintained by a system of annual inspection by an efficient staff at a cost of approximately $4,500 per annum, whereas the continued periodical application of DDT to all Georgetown premises would cost at least $105,000 per annum.

R. Ford Tredre

SACCA, G. Contributo alla conoscenza tassonomica del "gruppo" *domestica* (Diptera, Muscidae). [**Contributions to the Taxonomic Knowledge of the "Group"** *Musca domestica*] *Riv. di Parassit.* Rome. 1953, Apr., v. 14, No. 2, 97–114, 3 figs. [12 refs.] English summary.

In an attempt to differentiate between the varieties of *Musca domestica* the author examined large numbers of dry and living specimens of house-flies from Europe, Africa and Asia. The following characters were used to identify the varieties: (1) the relationship between the maximum width of the head and the minimum width of the frons expressed as an index; (2) the colour of the face; (3) the colour of the abdominal tergites which may range from completely black to a small median black area extending to the 1st, 2nd or 3rd visible tergite; strains of house-flies collected in the field may show a great variation in this character, but stocks bred in the laboratory show little variation; (4) the colour of the abdominal sternites, which vary from ivory white to black; (5) the size of flies (calculated by counting the number of pupae which occupy the space of 1 cc.); (6) the setae, particularly the length of the posterior dorso-central bristles.

The 3 forms, *domestica*, *vicina* and *nebulo* are not always readily distinguishable, even by the head/frons index. Many intermediate forms exist, and it was found that temperature and environment during development may modify the frons considerably. It was not always possible to classify house-flies collected from central Italy as *domestica* or *vicina*. Some flies

possessed characters which were intermediate between the two forms and the degree of melanism and the width of the frons were found to vary with the time of year at which the flies were collected. Strains of flies kept in the laboratory for a considerable period of time changed their characters. An Indian strain of *M. domestica nebulo* with a head/frons index of 12·3 was found to have a head/frons index of 8–9 (characteristic of *M. domestica vicina*) after 43 generations of breeding in the laboratory. It seems probable that each population maintains its own individuality through the pressure of climatic and environmental factors which have a selective effect.

M. domestica vicina and *M. domestica cuthbertsoni* are both found in certain districts of N. Africa and are usually readily distinguishable. In Morocco, for instance, both forms occur in the same district and are distinct, yet intermediate forms can exist. A strain of *M. domestica cuthbertsoni* collected from Ouargla (Sahara) was maintained for 5 generations in the laboratory. During this time the head/frons index changed from 16 to 12·7 and the posterior dorso-central bristles increased to a length characteristic of *M. domestica vicina*. There would therefore appear to be a close affinity between *cuthbertsoni* and *vicina* and it is suggested that these 2 forms should be regarded as the same species. *C. Mary Harrison*

SILVERMAN, P. H. & SILVERMAN, L. **Growth Measurements on *Musca vicina* (Macq.) Reared With a Known Bacterial Flora.** *Riv. di Parassit.* Rome. 1953, Apr., v. 14, No. 2, 89–95, 3 figs.

Although conditions, *e.g.*, temperature, humidity and composition of the media, are standardized for rearing house-flies in the laboratory for experimental purposes, there is frequently a considerable variation in the growth rates of larvae. Little attention has been paid to the microflora of the media, however, and the experiments described in this paper demonstrate that the microflora is of considerable importance.

A water suspension of bacterial flora was prepared by washing 10 gm. of 5-day-old media with 50 cc. of sterile water. This solution was then filtered, and 5 cc. of the filtrate was added to 40 gm. of autoclaved medium which was then incubated at 35°C. for 5 days. Subcultures were taken every 15 days. An analysis showed that 70 per cent. of the microflora consisted of *Bact. coli* and the remaining 30 per cent. was composed of *Sarcina*, *Bacillus subtilus* and *Lactobacillus*.

House-fly larvae (*Musca vicina*) were reared in standard medium in glass jars 8 in. in height by 6 in. in diameter. The autoclaved medium was allowed to cool and each jar was seeded with 1,000 to 1,250 eggs in 20 cc. of water suspension of the stock bacterial flora. The cultures were kept at 27°±2°C. and 60±5 per cent. relative humidity.

It was found that the addition of a stock bacterial flora reduced the temperature differences between different rearing jars. The temperature of the medium rose rapidly in the first few days, reaching a maximum of 42°C. on the fourth day and dropping to 35°C. on the eighth day. Reproducible results were obtained only after the flora had passed through 4 sub-cultures. During the larval stage the medium changed from a slightly acid (*p*H 6·8–7·0) to an alkaline state (*p*H 7·4–8·5). If the jars were seeded with a greater number of eggs the medium became more alkaline. Under these standard rearing conditions the average length of the cephalopharyngeal skeleton of larvae increased from 0·2 mm. on the first day to 1·25 mm. on the fifth day. When 3 days old all the larvae were in the second stage, and by the fourth day 90 per cent. had completed their second moult. The

weight of larvae changed from 6 mgm. at 4 days to 23 mgm. on the seventh day, followed by a loss of weight in the first 48 hours of pupation.

The authors suggest that the microflora probably breaks down the medium and makes it available to the larvae and also produces the desired temperature in the medium. Where the microflora is uncontrolled, and fermentation temperatures are low, the larval period is prolonged, or where temperatures are high the larvae produced are small. *C. Mary Harrison*

MADWAR, S. & ZAHAR, A. R. **Some Ecological Observations on Houseflies in Egypt.** *Bull. World Health Organization.* Geneva. 1953, v. 8, No. 4, 513–19, 8 figs.

The authors have continued their work on fly populations in lower Egypt by counting flies resting on moveable "Scudder" grids [see this *Bulletin*, 1951, v. 48, 929]. The curves reproduced for 1949, 1950 and 1951 show very clearly that there are two peaks of abundance, in spring and autumn, with a decline in the hottest part of the summer. This confirms the results of earlier observers: for example P. R. WILSON (*Rap. sur les Conjonctives de l'Enfance. Ass. de l'Ass. Internat. de Prophylaxie de la Cécité*, Paris, 1936) and M. HAFEZ [this *Bulletin*, 1943, v. 40, 93]. Confirming these earlier results, the authors find no connexion between relative humidity and fly abundance and the only relevant factor seems to be temperature. The decline in numbers during the summer seems to begin at 26°C. The winter depression follows the fall of the temperature below 14°C. However, there are exceptions to these rules: for example, in 1951 fly numbers began to rise in mid-summer with temperatures definitely above 26°C.

Seeking another explanation, the authors compare numbers of manure heaps in the vicinity of Talbia with fly counts. A correlated decline in numbers of manure heaps was observed in 1950, but not in 1951; so this factor does not seem to be dominant.

Figures of fly counts indoors and out of doors for 1950 and 1951 give a clear indication of changed habits of flies according to temperature. From 14°C. to 21°C., flies are more prevalent out of doors; from 21° to 23·5°C., numbers are equal; and above 23·5°C., the numbers outside decline, while those inside remain about constant. *J. R. Busvine*

THOMPSON, R. K., WHIPP, A. A., DAVIS, D. L. & BATTE, E. G. **Fly Control with a New Bait Application Method.** *J. Econom. Entom.* 1953, June, v. 46, No. 3, 404–9, 4 figs.

The authors were concerned with finding practical solutions to the widely reported insecticide resistance of the house-fly (*Musca domestica*) and to the difficulty of obtaining and using special equipment for the application of insecticides.

A most effective mixture was made up as follows: 4 to 8 ounces of an attractant such as syrup or molasses was stirred into 2½ gallons of water to which was added ¼ pint of a special emulsifiable formulation called HL 636 which contained 10·7 per cent. lindane and 4·3 per cent. TEPP (tetraethylpyrophosphate). This diluted preparation then had a concentration of 0·15 per cent. lindane and 0·06 per cent. TEPP. The mixture was applied immediately after mixing by means of an ordinary garden watering can and when sprinkled on the floors of cow sheds and similar places, or on to sacking wherever flies congregate, a very rapid kill was obtained. After the

initial population had been reduced, a treatment every 2 to 4 days was sufficient for satisfactory fly control.

The rate of application depended on the state of the floors, but the best results were obtained when application was made in a wet strip rather than by a light sprinkle over the entire area.

To evaluate the toxicity of HL 636 to animals various tests were made, but no symptoms of insecticide poisoning were observed and no trace of lindane or TEPP was found in milk samples taken from cows in the treated barns. The primary hazard lies in handling the concentrated material and not in handling or using the diluted bait solution. *H. S. Leeson*

BURKHARDT, C. C. & DAHM, P. A. **An Urban Fly Control Campaign.** *J. Econom. Entom.* 1953, June, v. 46, No. 3, 409–14. [18 refs.]

"A community fly control program was conducted at Manhattan, Kansas, during the summer (June, July, and August) of 1950 following the methods of the Communicable Disease Center, U.S. Public Health Service. Periodic surveys of the city, using the Scudder fly grill, provided data on the over-all abundance of flies as well as some degree of differentiation of the abundance of certain species of flies. The data from Manhattan were compiled from an average survey of approximately 16 per cent of the total number of city blocks each week throughout the summer season. Fly population data from a nearby city (Lawrence, Kansas) of similar size and in which no fly control operations were conducted, served as a comparison for the data obtained at Manhattan. Improved sanitation and a 2·6 per cent water emulsion spray of DDT were used to reduce the fly population in Manhattan during the summer. The following conclusions can be drawn from this study:

"1. A consistently lower fly population was present in Manhattan throughout the summer than in the nearby city of Lawrence which served as an untreated reference city. The seasonal over-all, weighted, city fly grill average for Manhattan was 2·1 flies per grill count and 6·6 flies per grill count for Lawrence.

"2. The house fly, *Musca domestica* L., was the most abundant species of fly in both cities during the summer, making up approximately 58 and 54 per cent of the total fly population in Manhattan and Lawrence, respectively.

"3. The second most abundant group of flies were the greenbottle flies of the genus *Phaenicia* (=*Lucilia*). In Manhattan these species of flies comprised approximately 28 per cent and in Lawrence, 32 per cent, of the total number of flies during the summer.

"4. Blow flies of the genus *Phormia* and flesh flies of the genus *Sarcophaga* comprised less than 10 per cent of the total fly population in either city. Their trends of abundance followed those of *M. domestica* and *Phaenicia* spp. except that the highest populations occurred early in the season (June) for the blow flies and flesh flies.

"5. The major fly control problem in both communities, as gauged by the highest fly population data, occurred in the business districts.

"6. The fly grill method of determining fly populations would appear to be disproportionately time consuming and costly for a practical community fly control campaign. A rapid method of reconaissance surveying would seem better for this type of program.

"7. The application of the DDT water emulsion spray was largely responsible for an average of approximately 70 per cent control of flies in

Manhattan during the summer as determined by comparison with the data from Lawrence, Kansas. The cost of application of DDT for the control of flies in Manhattan during the months of June, July, and August 1950 was 9·6 cents per capita, exclusive of the salary of the supervisor."

CHOW, C. Y. & THEVASAGAYAM, E. S. **A Simple and Effective Device for Housefly Control with Insecticides.** *Bull. World Health Organization.* Geneva. 1953, v. 8, No. 4, 491–5, 2 figs.

It has often been observed that, during the day, few house-flies rest on walls but instead settle on the floor or on furniture (especially tables where food is being prepared). It is seldom feasible to spray furniture with residual insecticides, and residues on the floor would not remain effective for long; therefore many flies escape contact with residual insecticides.

To offer the flies greater chances of coming into contact with the poison, the authors have devised a simple portable wooden frame which can be treated with insecticide and placed anywhere in a fly-frequented room. It consists of 4 wooden strips ½ inch thick and 18 inches long, fixed in a square and criss-crossed with about 25 feet of thick (1/10 in.) string. The frame may be soaked in a 20 per cent. dieldrin preparation (Shell "Dieldrex 15") which gives excellent results, though 15 per cent. DDT or BHC is also effective. Each frame cost about 0·3 Ceylon rupees [about 5 pence]. Approximately 250 could be treated by 1 U.K. gallon of insecticide.

J. R. Busvine

HARRISON, C. Mary. **DDT-Resistance and its Inheritance in the House Fly.** *J. Econom. Entom.* 1953, June, v. 46, No. 3, 528–30.

Although insecticide resistance has occurred in very many parts of the world it is most prone to develop in regions where warm summers cause heavy fly breeding and consequent widespread use of insecticide. Comparatively few observations of fly resistance have been made in the field in Britain, but because of the importance of the problem, laboratory studies of exotic strains have been made. Most of the work has been done on two Mediterranean strains:— (1) a colony from Italy, obtained in 1948 and resistant to DDT only, and (2) a colony obtained from Sardinia in 1950 and resistant to a range of synthetic chlorinated insecticides as well as DDT. Apart from this immunity to other chlorinated insecticides (which seems to be quite an independent phenomenon) it has been shown that there are two distinct aspects of DDT-resistance. Thus, although both strains required about the same lethal dose of DDT applied topically, the Italian colony was much more resistant to the initial paralytic action of DDT than the Sardinian flies. This was not due to delayed penetration of the cuticle, for the difference remained if the dose were injected. These two forms of resistance have been linked with relative predominance of DDT-dehydrochlorination and another unknown defence mechanism. The former, which is slow in action and not likely to protect flies from temporary paralysis, predominates in the Sardinian strain. The unknown mechanism must be well developed in the Italian strain which is able to tolerate DDT analogues incapable of dehydrochlorination. [See this *Bulletin*, 1952, v. 49, 89; *ibid*, 1953, v. 50, 657.]

The establishment of these two types of DDT-resistance appears to explain inconsistent experimental results of genetical experiments with resistant

flies. Evidence from mass-crossing experiments with resistant and non-resistant strains done in the U.S.A. suggested a multiple factor inheritance of resistance [*Bulletin of Hygiene*, 1950, v. 25, 825]. However, individual reciprocal crosses by the author [this *Bulletin*, 1951, v. 48, 930] indicated a single factor inheritance, the non-resistant gene being dominant. The inconsistency is probably due to the fact that the American authors used lethal doses after topical application as their criterion of resistance, whereas Dr. Harrison measured resistance by time-before-paralysis. Some further single crossing experiments briefly described in this article were done with the Italian strain and a non-resistant strain. Resistance was measured by topical application and resultant mortality. The F1 was intermediate and homogeneous in resistance in 4 separate crossings, while the F2 generations were widely different in resistance, ranging from one extreme to the other. This evidence, confirming the American data, is consistent with the hypothesis advanced above. *J. R. Busvine*

MER, G. G. **Daytime Distribution of DDT-Resistant Houseflies Inside DDT-Sprayed Buildings.** *Bull. World Health Organization.* Geneva. 1953, v. 8, No. 4, 521–6.

The occurrence of DDT resistance in house-flies has led to the use of additional or substitute insecticides for fly control. It would be an advantage to limit the use of such an insecticide to those areas of a room where flies settle most frequently, to prevent the rapid production of resistance to these new insecticides.

Little is known about the daytime resting habits of house-flies, although it is well known that at night they frequently rest on parts of the walls and ceilings, and in some areas they leave the buildings at sunset and rest in trees and bushes.

Kitchens and dining rooms of houses in 5 collective settlements in Israel which had been treated twice monthly with 5 per cent. DDT in kerosene were visited many times at irregular intervals and at different times of the day, during the months from July to October 1952. The numbers of flies resting on different surfaces were counted at each of these visits.

Only a small proportion of the flies rested on the walls and ceilings treated with DDT, the windows and doors were more attractive, and the furniture was most highly frequented. The author suggests that the spraying of walls and ceilings involves wastage of labour and that it would be desirable to develop an insecticidal preparation which could be used for the residual treatment of furniture. [The possibility that the DDT acts as an irritant and that the flies therefore prefer to rest on the untreated surfaces of a room should not be overlooked.] *C. Mary Harrison*

WIESMANN, R. & KOCHER, C. Untersuchungen über ein neues, gegen resistente *Musca domestica* L. wirksames Insektizid. [**Investigations on a New Insecticide Active Against Resistant** *Musca domestica*] *Ztschr. f. Angewandte Entom.* 1951, Nov., v. 33, Nos. 1/2, 297–321, 7 figs. [29 refs.]

The insecticide Pyrolan (1-phenyl-3-methyl-pyrazolyl-(5)-dimethylcarbamate) is soluble in most organic solvents, and is also soluble in water at 20°C. to 0·1 per cent. The LD50 by mouth to rats for this insecticide is ·62 mgm. per kgm. and for mice 90 mgm. per kgm. Toxicity to man is

similar to that of rotenone, and absorption through the skin is so small that it is unnecessary to take special precautions when using this insecticide.

This paper on Pyrolan is divided into 2 sections. Section I deals with the mode of action of the insecticide and Section II with practical experiments in which Pyrolan was used against DDT-resistant house-flies.

I. Pyrolan may act as a stomach poison as well as a contact insecticide. Lepidopterous larvae (*Arctia caja*, *Vanessa jo*, *Thaumatopoea processionaria*) in the 3rd and 4th instars, however, when fed for 4 consecutive days on plants covered with 7 to 10 mgm. of insecticide showed no signs of poisoning. Similar results were obtained with *Blatta americana*, and *Melolontha melolontha*. A number of other insects, particularly sucking insects, on the other hand, can be poisoned by Pyrolan taken by the mouth. Hungry adults of some species fed from a calibrated pipette with 10 per cent. sugar water in which Pyrolan was dissolved were killed readily, as shown in the following table.

Species	LD50	LD100
	mgm./kgm.	*mgm./kgm.*
Plusia gamma	24	30
Apis mellifica	13	18
Musca domestica	3·2	27
Ephestia kühniella	0·5	0·7

Pyrolan also has a good contact effect, and at a high concentration affects many species. At low concentrations few species are affected, but *Musca domestica* is among these.

The symptoms of poisoning by Pyrolan are characteristic, and in the cockroach are the same whether the poison has been taken by mouth, injected, or has been taken up over the body surface. The insects frequently show a loss of coordination, fall on to their backs, and the legs show tetanic spasm or tremor or extension. These tremors are striking, and normally, between the tremors, which pass to all legs simultaneously, there are intervals in which the legs are fully relaxed. At first there are 5 to 6 tremors per minute but they gradually weaken with the intervals between tremors lengthening until the insect either dies or recovers. The mouth-parts also carry on constant movements whereby the insect swallows air and the abdomen swells.

These poisoning symptoms suggest that the point of action of the insecticide is the nervous system. If a cockroach is decapitated after Pyrolan has been administered, the mouth-parts still undergo constant movements and the legs also show the characteristic tremors. The cerebral and sub-oesophageal ganglia appear to be responsible for the movements of the mouth-parts and the swallowing of air, since if Pyrolan is injected carefully into these ganglia the mouth-parts carry out their characteristic movements but the leg tremors and knock-down do not occur. The thoracic ganglion, on the other hand, is responsible for the leg tremors. A 0·1 per cent. water solution of Pyrolan applied to the exposed thoracic ganglion leads to clonic spasms of the legs. When the excited ganglion is treated with a 2·5 per cent. solution of barbituric acid the legs become quiet but the addition of Pyrolan to the ganglion leads to the recurrence of leg tremors. When the leg nerves of a *Blatta* showing strong leg tremors are severed close to the ganglion the tremors cease. The clonic spasms induced by Pyrolan in the legs are only possible provided that the reflex arc is intact. Stimulation with Pyrolan appears to be different from stimulation with DDT in that it affects the motor part of the ganglion.

Injection of Pyrolan into the haemocoele of the cockroach causes the heart beat to cease for a minute, and when pulsation begins again it is at half the normal strength. The possibility of Pyrolan being stored in certain organs of an insect was investigated by taking nymphs of *Blatta americana* and exposing them in Petri dishes coated with Pyrolan for 2 to 4 hours. These nymphs were washed in acetone and then dissected and the various organs offered to hungry *Musca domestica*. The percentage of flies poisoned by feeding on the various organs is shown in the following table:

Organs of Blatta	*Percentage of flies knocked down after 6 hours' exposure*
Fore legs	32
Middle and hind legs	15
Fat body	10
Thoracic muscle	16
Thoracic ganglion	35
Whole insects	0

Immediately after a leg tremor there are strong respiratory movements of the abdomen which were shown experimentally to be regulated by the mesothoracic ganglion. The prothoracic and mesothoracic spiracles close during a strong tremor, but between tremors they open wider than normal and remain open until the next tremor begins. The increased breathing rate and the holding open of the thoracic spiracles leads to an abnormally high water loss which may be twice that of normal insects. During poisoning with Pyrolan the *p*H of the blood and muscle becomes more acidic, probably owing to the production of lactic acid resulting from muscular activity. The death of the insect is thought to be due largely to exhaustion.

II. It appears from the mode of action of Pyrolan that it might prove useful in combating DDT-resistant flies. Pyrolan was therefore prepared as an aerosol and was tested against resistant flies. At a concentration of 0·5 per cent. the time required for 50 per cent. knock-down was only 15 minutes 30 seconds, whereas a 5·0 per cent. solution of DDT failed to give 50 per cent. knock-down in one hour. With non-resistant house-flies any increase in the concentration of Pyrolan over 2 per cent. did not lead to an increase in effect, but this was not so for DDT-resistant flies.

During the spring and summer of 1949 and 1950 experiments were carried out in rooms which were sprayed with mixtures of DDT and Pyrolan at the rate of 3 cc. per sq. metre. The knock-down effect with either 5 per cent. DDT and 0·5 per cent. Pyrolan, or 5 per cent. DDT and 1 per cent. Pyrolan was good, all flies being knocked down within 15 minutes. Glass or wood squares treated with either DDT or Pyrolan at 0·5 gm. of insecticide per sq. metre were left exposed to the air for 1, 7, 14, 21 or 28 days. Exposure of normal and DDT-resistant flies to these deposits showed that Pyrolan remained effective for several weeks. Good control of house-flies and other flies was achieved in house spraying experiments in Berne with a 2 per cent. Pyrolan and 5 per cent. DDT mixture at 15 cc. per sq. metre, and also in Sardinia with a 5 per cent. Pyrolan and 5 per cent. DDT at 20–25 or 40–50 cc. per sq. metre. In laboratory experiments Pyrolan mixed with the larval media also proved to be an adequate larvicide against resistant fly larvae.

The selection of flies of a non-resistant strain with Pyrolan over successive generations did not give rise to a Pyrolan-resistant race. Similarly, a DDT-resistant strain treated with Pyrolan over 18 generations did not build up

a resistance to Pyrolan, although the authors suggest that it is unwise to draw definite conclusions from these experiments, since they may not have been carried on over a sufficient number of generations.

C. Mary Harrison

CAMPAU, E. J., BAKER, G. J. & MORRISON, F. D. **Rearing Stable Fly for Laboratory Tests.** *J. Econom. Entom.* 1953, June, v. 46, No. 3, 524.

The technique for rearing *Stomoxys calcitrans* has several points in common with the Peet-Grady method for rearing the house-fly.

The oviposition cage (30 × 30 × 28 inches), which contains 4000–8000 flies, is provided daily with two 4-inch evaporating dishes each containing a moistened wad of cellu-cotton covered with citrated ox blood. The flies lay their eggs in the dishes when the blood level has dropped; spent dishes are removed and fresh ones are introduced. The eggs are washed and decanted with tap water and are seeded on to Peet-Grady larval medium in battery jars. The jars are left undisturbed until the pupae begin to appear in about 9 days. The pupae are collected into beakers and put into holding cages. On the 14th day after seeding, flies begin to emerge and the peak emergence occurs about the 17th day. Flies which are not used in experiments are moved into the oviposition cage to maintain the colony and the next batch of eggs appears on the 21st day after the previous one.

Average figures from 19 cultures are 86 per cent. emergence from pupae and 57 per cent. of eggs developed to adults. *H. S. Leeson*

MICKS, D. W. & CALMA, V. C. **Nasal Myiasis of Man due to the Screwworm Fly** (*Callitroga americana*, **C & P**). *Texas Reports on Biol. & Med.* 1952, v. 10, No. 4, 855–65, 1 fig. [23 refs.]

The authors begin by briefly reviewing the literature on *Callitroga americana* [formerly known as *Cochliomyia americana*] and give records by various writers in which death is said to have resulted from infestation of man by these flies.

They describe symptoms in nasal myiasis caused by these flies. There is initially a feeling of discomfort in the nose, soon followed by headache over one or other paranasal sinus, and accompanied by a rapidly worsening sero-sanguineous discharge. About the 3rd or 4th day a swelling of the nose and face, usually mainly unilateral, appears and is accompanied by acute local pain. The pain becomes excruciating and the nasal discharge increases. Epistaxis at this point may be very extensive. Later, larvae may be either sneezed up or blown up with purulent post-nasal secretions. The patient's temperature usually reaches a peak of 103°F. to 104°F. and in some cases delirium or coma may supervene. The white blood cell count may be as high as 12,000 per cmm.

The authors discuss the occurrence of many mistakes in earlier studies on nasal myiasis. They find from their analysis of the literature that the majority of cases occur in adults and not in children as some previous workers have maintained.

They do not regard close association with livestock as essential, and note that many cases have occurred in areas where the screwworm population was low. (It should be noted that the adult female fly is capable of flying 9 miles.) A predisposing pathological condition of the nose or sinus is one

of the most important factors which contribute to the serious nature of nasal myiasis, and though the normal nasal mucosa may be attacked, this is rare. The nose is the common site of attack but the eyes, ears, pharynx and mouth may also be affected.

Early diagnosis is important but difficult. The authors point out that *C. americana* and not *C. macellaria* is the primary screwworm fly and that *C. americana* is the important species in these cases.

Treatment should be instituted immediately. The nasal passages should be wiped clean and irrigated with saline to remove the secretions. Cocaine (4 per cent.) or adrenaline may then be applied to shrink the nasal mucosa followed by the application of 15–25 per cent. chloroform in a light vegetable oil. Until there is no longer any evidence of screwworms these may be removed mechanically with forceps. Secondary infection may be treated with antibiotics.

Prevention consists in protection and treatment of all wounds (especially those of the nose, ears, eyes, mouth and throat), screening of living quarters and control of flies by the proper disposal of infested carcases and direct application of insecticides. *M. Lavoipierre*

Basu, B. C., Menon, P. B. & Sen Gupta, C. M. **Regional Distribution of *Tabanus* Flies in India and its Relationship to the Incidence of Surra.** *Indian J. Vet. Sci. & Animal Husbandry.* 1952, Dec., v. 22, Pt. 4, 273–92, 2 maps on 2 pls.

Parrot, L. Notes sur les phlébotomes. LXVII.—Les "papilles" des antennes. [**Notes on *Phlebotomus*. LXVII. The "Papillae" of the Antennae**] *Arch. Inst. Pasteur d'Algérie.* 1953, June, v. 31, No. 2, 110–18, 2 figs. [13 refs.]

Wanson, M. & Lebied, B. L'habitat larvaire de *Simulium renauxi* Wanson et Lebied. Description de la pupe et des terminalia du mâle. [**The Larval Habitat of *S. renauxi*: Description of the Pupa and the Male Terminalia**] *Rev. Zool. Bot. Africaines.* 1950, Dec. 30, v. 44, No. 1, 25–9.

This paper describes the pupal stage and the genitalia of the adult male (removed from the pupa) of *Simulium renauxi*. The pupae were found in August, 1950, on crabs (*Potamonautes lueboensis*) in a small, rapidly flowing stream in a forest near Tsaka, Belgian Congo. The female was recently described as a new species very similar in appearance to *S. neavei* and biting man. In the present paper the authors express the view that *S. renauxi* is a valid species, although it differs so little from *S. neavei*. [The reviewer could not find the 3 figures referred to in the description of the pupa.] *D. S. Bertram*

Davies, D. M. **Longevity of Black Flies in Captivity.** *Canadian J. Zool.* 1953, June, v. 31, No. 3, 304–12, 7 figs. [11 refs.]

These experiments with black-flies (species of *Simulium*) were made during the summers of 1948–1950 in Ontario, Canada, to discover the type of food that would give the greatest survival in captivity. In most of them female flies were used, 95 per cent. of which were *Simulium venustum*.

For the longevity tests flies were kept and fed at laboratory temperature in open-ended glass tubes. A number of flies (from 1 to 35) were placed in each tube and the ends were plugged with cotton wool; the tubes were then stood in jars containing ¼ inch of water or aqueous solution, the bottom plug being out of contact with the liquid; a narrow tube containing a wick passed through the bottom plug and dipped into the fluid. The flies could thus obtain moisture from the wick.

Some flies were given no food or water; others were provided with sucrose crystals or cut raisins and no water; others with moisture by the wick and one of the following dry nutrients, either sucrose crystals, or cut raisins or albumin or sucrose with albumin; another group were offered these nutrients in solution through the wick.

It was shown that black-flies need water to live and some nutrient for survival beyond 3 days. Best results were obtained with dry sugar scattered on the plug and water only in the jar. This was true whether the flies had previously fed on the blood of ducks or not. The longest survival for *S. venustum* kept at outside temperature during June and July was 37 days; 18 (4 per cent.) lived for at least 20 days on the dry sucrose and water. Some flies were exposed to outside temperatures during August and were then kept at 52°F. (11°C.); of these, 1 *S. vittatum* lived 61 days; 1 *S. decorum* lived 63 days, 2 *S. decorum* for 35 days and 5 for 33 days.

Most flies that partook of a full blood meal died within 2 days; others, given a partial blood meal lived longer but not so long as those that had no blood meal at all; if they fed on the uninfected blood of ducks they lived longer than those fed on blood containing gametocytes of *Leucocytozoon*.

Collecting and feeding techniques are described, results are tabulated, graphed and compared with those of other authors. *H. S. Leeson*

J. Amer. Med. Ass. 1953, June 27, v. 152, No. 9, 818–21. **Use and Abuse of Generic (Coined Common) Names for Pesticides.** [Report from the Committee on Pesticides to the Council on Pharmacy and Chemistry.]

The selection and establishment of non-proprietary names for chemicals is a task undertaken by certain groups in the U.S.A. and some other countries.

This paper reviews the history of this practice in America and indicates certain current problems as they relate to pesticides. Until World War II names of insecticides and rodenticides were comparatively few and relatively simple. The war brought about a revolution in the chemical industry of pesticides; its growth and influence together with the rise in the number and complexity of its products prompted public health and agricultural authorities to consider coined, common names for pesticides.

Lists are given of the common generic, chemical, trade and other names of some examples of pesticidal chemicals which are used as "economic poisons", such as aldrin, dieldrin and warfarin, and of others which are used as "therapeutic agents", such as dimethylphthalate, *gamma* benzene hexachloride and pyrethrum. The lists are not complete, of course, but are given to illustrate the complexity of the nomenclature.

The basic principles adopted are that all names should be short and distinctive in sound and spelling and should not conflict with terms already in use. Names should apply to the basic chemical to avoid multiple and dissimilar names for variations of the parent compound. Names may be

either pseudo-chemical such as benzeen hexachloride, borax and phenobarbital, or fanciful such as dieldrin, nicotine and penicillin.

Certain objections to these principles are pointed out and some current problems are mentioned, chief among which is the use in countries outside the country of origin of the same or similar names leading to confusion and misunderstanding in the literature; in addition to etymological difficulties legal hardship may be involved.

International and intranational agreement on terminology can minimize these difficulties and hardships. The Committee on Pesticides of the Council on Pharmacy and Chemistry hopes that greater consideration will be given to this matter in future. *H. S. Leeson*

HOUPEAU, J. L. & LHOSTE, J. Appareils français pour l'épandage d'insecticides sanitaires. [**French Apparatus for Spraying Sanitary Insecticides**] 230 mimeographed pp., 149 figs. on 36 pls. 1953. Paris: Office de la Recherche Scientifique Outre-Mer, 20, rue Monsieur, 7e.

This mimeographed booklet is a kind of omnibus catalogue of the commercial models of spraying and dusting equipment obtainable in France. The various kinds of apparatus are classified under 8 main headings or chapters: *e.g.*, "*Poudreuses à main*", "*Poudreuses portatifs*", "*Poudreuses à grand travail*". Sub-divisions within these chapters consider machines worked by levers as opposed to those worked by a crank-handle; or, elsewhere, group sprayers according to whether they are worked by piston or diaphragm or by compressed air. From these examples, it will be seen that the classification is rather that of an engineer or manufacturer than of an applied entomologist, who will be more interested in the droplet sizes produced by sprayers in relation to control problems.

The description of the various models is quite impartial without any indication of respective merits or performance. Archaic spraying machines are detailed in the same way as the most recent inventions. For this reason the book is not helpful to an inexperienced sanitarian who is looking for guidance; but it may be a useful reference list for the man who knows exactly the type of machine he wants and requires comparative specifications of the models produced by different firms.

The types of apparatus considered are quite varied and include: various types of dusting machines; hand atomizers; pneumatic and hydraulic sprayers; mechanical atomizers; heat atomizers; aerosol bombs. Nearly every model is illustrated by a rather crude outline drawing and a few are explained by diagrams. *J. R. Busvine*

BULL. WORLD HEALTH ORGANIZATION. Geneva. 1953, v. 8, No. 4, 527–33. [14 refs.] **Techniques and Materials for the Disinsectization of Aircraft.** [Paper prepared by Staff of Communicable Disease Center, Public Health Service, U.S. Dept. of Health, Education & Welfare, Savannah, Ga.]

The standard procedure for disinsectization of aircraft, recognized by the U.S. public health authorities, is the dispersion throughout the aircraft of one of the following aerosols, at least 30 minutes before arrival.

"G 382" 3 per cent. DDT, 5 per cent. pyrethrum extract (20 per cent. pyrethrins), 7 per cent. solvents and oil, 85 per cent. Freon 12.

"G 651" 2 per cent. DDT, 6 per cent. pyrethrum extract, 8 per cent. solvent, 84 per cent. Freon 12.

These ingredients are distributed by low-pressure aerosol bomb at the rate of 5 gm. per 1,000 cu. ft. All ventilators and other openings are kept closed during distribution and for 3 minutes thereafter.

Although these treatments are adequate to kill mosquitoes in passenger compartments, they only destroy a small proportion of house-flies. Higher doses or longer closures may be more effective [as in the British recommendations: see this *Bulletin*, 1950, v. 47, 894; 1951, v. 48, 590]. However, it is considered that such may annoy passengers and crew.

Further investigations of alternative formulae and other disinsectization measures have been proceeding in the U.S.A. both in the laboratory and in actual aircraft. As test insects, non-resistant female *Musca domestica* were used; these are more resistant than mosquitoes. They were not confined in cages (which were considered unreal) and were marked with coloured nylon threads gummed to the thorax to assist recovery and identification of insects used in different tests.

Two more effective aerosols employ *gamma* BHC and pyrethrum synergists [following the lines of the British papers mentioned, to which no reference is made]. These are:

"S 112A" 3 per cent. DDT, 1 per cent. *gamma* BHC, 11 per cent. solvent and 85 per cent. Freon.

"S 140A" 3 per cent. DDT, 2 per cent. pyrethrum extract, 3 per cent. synergists, 7 per cent. solvents and 85 per cent. Freon. Another improved formula, "G 1013", resembles G 382 but has an additional 2 per cent. of allethrin. It is expected that "G 1013" and "S 140A", used at 7 gm. per 1,000 cu. feet, will soon be approved in the U.S.A. as replacements for "G 382" and "G 651".

For use in baggage compartments, the high dosage of 20 gm. per 1,000 cu. feet may be required to ensure penetration. In passenger and crew compartments treatments are sometimes ineffective because of inadequate dosing by the crew. This could be obviated by a single fixed-dose aerosol apparatus and this possibility is being examined.

Residual treatments with insecticides in baggage compartments tend to be inefficient, because, with the many available untreated resting places, most of the insects escape lethal doses. Thus, dieldrin at 100 mgm. per sq. ft., after 2 weeks failed to kill free-flying house-flies and *gamma* BHC at the same dose only lasted 1 week (though at 200 mgm. per sq. ft. it was effective for 5 weeks).

A promising idea for using *gamma* BHC vapour was the following: glass-wool air filters impregnated with acetone solutions of *gamma* BHC were fixed in the ventilation system of the aircraft. The resulting vapour was sufficient to kill nearly all free-flying house-flies in the plane. Air samples collected while these filters were in place were estimated for *gamma* BHC and the results indicated concentrations of 0·16 μgm. per litre.

J. R. Busvine

EDNEY, E. B. **The Construction and Calibration of an Electrical Hygrometer Suitable for Microclimatic Measurements.** *Bull. Entom. Res.* 1953, July, v. 44, Pt. 2, 333–42, 5 figs.

LABORATORY PROCEDURES

SHAPER, A. G. **A Liver Function Test Suitable for Tropical Practice.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, July, v. 47, No. 4, 324–8.

MALLEN *et al.* (*Amer. J. Clin. Path.*, 1950, v. 20, 39) described a test with strong Lugol's solution for detecting abnormal serum proteins, and WOOLF (*S. Afr. Med. J.*, 1951, v. 25, 789) studied it further. These investigations showed a definite correlation between the iodine test and many of the well-known tests for liver function, in that a positive iodine test was usually accompanied by a positive result in one or more of the other tests, while a negative iodine test was not. In general, however, the empirical liver function tests were found to be unreliable and Woolf suggested that the iodine test was the most dependable of them.

The present author, from the African Hospital in Salisbury, Southern Rhodesia, has studied the test in an area where no other tests of liver function are available, other than careful clinical assessment. It was used in all cases in the Hospital where liver damage was diagnosed or hepatic enlargement was discovered incidental or secondary to other conditions. There were 133 tests done, 50 being controls on apparently healthy African hospital staff. The remainder were concerned with (1) liver failure (28 cases), (2) hepatic enlargement as defined above (22), (3) congestive cardiac failure (12), (4) liver abscess (4), (5) diabetes (3), and (6) pneumonia with jaundice (14).

The test consists of mixing 1 drop of patient's serum on a slide with 1 drop of strong Lugol's solution (iodine, 20 gm.; potassium iodide, 40 gm.; distilled water, 300 ml.). The result must be read in 1 to 2 minutes: in less than 1 minute there is an apparent granularity which clears in the first minute. In a negative reaction, the mixture remains transparent: in a positive reaction, there is precipitation varying from a very fine precipitate to the immediate formation of a heavy brown or black precipitate. The results are graded + to + + + +, corresponding to weak, moderate, strongly and very strongly positive.

The results are discussed in detail in the text and some of them shown in tables. The important findings were that all the patients with liver failure or carcinoma (group 1) were positive with the iodine test and gave strongly positive results in more than 85 per cent. of cases, while those in group 2 showed only 14 per cent. strongly positive [shown in the author's summary as 17]. Groups (3) to (5), involving conditions where liver involvement is constant, gave about 95 per cent. of positive reactions. The final group gave negative results in 70 per cent. of cases. In 15 cases coming to autopsy, no correlation was found between the iodine test and the degree of histological involvement found. Forty-eight of the controls were negative by the iodine test and the other two showed only + + and +.

In discussion, the author refers to the limitations and non-specificity of many of the common tests for liver function, and their impracticability for the isolated practitioner. As, however, many of them depend on changes in serum protein, it seems reasonable to use a test based on the same principles, but simpler to perform. The iodine test therefore seems to be as useful as any of the other tests in areas where these cannot be performed, and false positive reactions with it appear to be unlikely: but the author, with admirable caution, observes that "there is as yet no test of liver

function which approaches in value a balanced clinical judgement of the patient's condition". *H. J. O'D. Burke-Gaffney*

ANDREWS, W. H. H. **A Technique for Perfusion of the Canine Liver.** *Ann. Trop. Med. & Parasit.* 1953, June, v. 47, No. 2, 146–55, 4 figs. [10 refs.]

REPORTS, SURVEYS AND MISCELLANEOUS PAPERS

COLONIAL OFFICE. **Economics of Agriculture in a Savannah Village. Report on Three Years' Study in Genieri Village and its Lands, The Gambia** [HASWELL, M. R.]. Colonial Research Studies No. 8. 142 mimeographed pp., 21 figs. [Refs. in footnotes.] 1953. London: H.M. Stationery Office. [15s.]

There is nothing new in the idea that the health of the people of Africa—and of course of many other parts of the world—depends as much on economic as on medical activities. The interest taken in economic affairs by public health authorities is, however, increasing, and entails a much wider knowledge than was at one time considered necessary of the entire activities of the people. The author of this report has been closely associated with Professor B. S. Platt and his staff in their researches on nutrition in the Gambia, during which the importance of agricultural methods to health has been sufficiently obvious. She has studied her subject for 3 years, and presents her results in this very full report.

After an introduction and a short historical note, successive chapters deal with social organization and labour resources; natural resources (including soil, crops, stock and the seasonal changes which affect labour tasks); economic analysis of choice of product and intensity; conclusions on African farming and on social changes, and mechanization. Much detailed information is contained in tables and figures in the text, and in 10 appendices.

The report is a sociological and economic study which will surely be used extensively as a work of reference, and which should be studied not only by the agricultural authorities but by medical men who must understand the background of the physical and mental disabilities they encounter, and, of course, by the administration officers. *Charles Wilcocks*

BRAZZAVILLE [A. E. F.]: Rapport sur le fonctionnement technique de l'Institut Pasteur de Brazzaville en 1951. [**Annual Report of the Pasteur Institute at Brazzaville for the Year 1951**] [CECCALDI, J., Director]. 95 pp. 1953.

The Institute was short of professional staff during the year, but nevertheless the Director is able to present an imposing record of work. In addition to the production of nearly 2 million doses of vaccines and sera, there was a large volume of routine examinations carried out. The total of 46,856 included 8,720 bacteriological investigations, 3,987 cytological, 33,010 serological and biological, 889 histological and 250 miscellaneous. In addition, over 1,000 laboratory animals were inoculated for various purposes.

The routine work is set out in detailed tables, with comments on some of the features. Considerable space is given to *rabies* and its prevention: details are given of the vaccine used and its maintenance and there is a description of an outbreak of canine rabies in Brazzaville and of studies arising out of it: this has been fully noticed in this *Bulletin*, 1953, v. 50, 108. Studies were made of 6 strains of the virus from Brazzaville and 3 from Oubangui and these are briefly listed. There were 275 persons treated in the Institute and 67 in other stations. These courses of anti-rabic treatment are classified and notes are given of the only 2 deaths which occurred. There were 1,516 dogs vaccinated.

No case of *yellow fever* was confirmed in French Equatorial Africa in 1951, but reference is made to a suspected case in a European from the Cameroons, in whom histopathological examinations suggested yellow fever.

Research studies included the isolation of local strains of *encephalomyelitis* virus, and a brief account is given of 9 strains studied and of the character and maintenance of the virus.

The pathological section of the report lists 672 histopathological examinations of human material and 203 from animals. A separate section gives details of vaccines and sera prepared, issued and used. There is a large section devoted to sleeping sickness, which includes details of 2 new proved and one suspected case in Europeans and 112 cases in Africans. Diagnosis and treatment are discussed at length and much of the material will be familiar to readers of this *Bulletin* from the published reports of Dr. Ceccaldi, the Director of the Institute [see, for example, this *Bulletin*, 1953, v. 50, 609].

There is a chapter devoted to an account of the activities of the Experimental Station at Gamaba.

Finally, the Report records field work in connexion with surveys of tsetse flies in the Ouham and Ouaka-Kotto regions, and investigations on the island of M'Bamou. The latter included study of infection rates and rearing of tsetse flies and the part played by *G. palpalis* in the transmission of animal trypanosomes. *H. J. O'D. Burke-Gaffney*

Sergent, Ed. Rapport sur le fonctionnement de l'Institut Pasteur d'Algérie en 1952. [**Annual Report of the Pasteur Institute of Algeria for 1952**] *Arch. Inst. Pasteur d'Algérie.* 1953, June, v. 31, No. 2, 119–63. [30 refs.]

This Report gives an account of the various subjects for research studied at the Institute during the year: the results of the investigations have been mostly published and abstracted in this *Bulletin*.

There are also given brief accounts of the conferences, publications, field work and library activities, a list of the stock cultures held and a short report on the Ouled Mendil Marshes Experimental Station. The routine laboratory investigations are shown in detail in tables, as are the lists of histological products issued. It is noted that during the year, there were 12,785 investigations, which included 7,278 microbiological, 1,242 biological or histological, 2,790 chemical, 22 agricultural and 1,453 zoological determinations.

The section on antirabies vaccine is detailed. It shows that 98,186 ampoules of phenolized vaccine were issued. There were 1,889 persons

treated, with 9 deaths and no paralytic accidents. There was also issued sufficient antirabic vaccine for the prophylactic inoculation of 33,000 dogs.

Dr. Edmond SERGENT and his staff are to be congratulated on another year of varied and interesting work. *H. J. O'D. Burke-Gaffney*

SAIGON (VIETNAM): INSTITUT PASTEUR DE SAIGON. Rapport sur le fonctionnement technique en 1952. [**Annual Report for 1952**] FOURNIER, J., Director. 157 pp., 2 graphs. 1953.

This Report is divided into 3 parts: (1) research, shown under 20 sectional headings, (2) teaching, conferences and visits, and (3) routine work. The very considerable staff is listed at the beginning of the report and it is clear that the range of work undertaken is very wide indeed.

The first part deals with the many investigations undertaken, a number of which have been the subject of papers already abstracted in this *Bulletin*. Of special interest are some of the following:

Leptospiroses

There is an account of the types of leptospires identified in South Vietnam, the predominant type being *L. australis*, although *L. icterohaemorrhagiae* was also found. An epidemic occurred in troops operating in marshy regions in South Vietnam: 40 cases were reported and 22 were confirmed serologically. It is believed that pigs are an important reservoir.

Melioidosis

An extensive account is given of the work on *Pf. whitmori* with much of which readers of this *Bulletin* will be familiar.

Poliomyelitis

Poliomyelitis has been known to exist in Indo-China for many years. In 1952, it was confirmed for the first time in the laboratory by the isolation of 7 strains of the virus, and an account of them is given.

Rabies

The preparation of antirabic vaccine is described and it is noted that this is now prepared from goats instead of from rabbits. A note is also presented on the successful treatment of 2 severe cases of post-vaccinal central nervous accidents with ACTH, Phenergan and novocaine.

Salmonella infections

The various species met with are identified and discussed, and their types set out. The rarity of the types common in Europe is noted, while those types rare or unknown in Europe were relatively common.

The routine report gives a detailed account, with tables, of the various sections of the laboratory. There is much detail regarding the cases of *leprosy* seen, which amounted to 2,620, of which 298 were new cases in 1952. Further details are given of the *rabies* work. In 1952, there were 3,796 persons admitted for treatment, but 47·04 per cent. did not complete the course. It is noted that 5 severe reactions and 2 paralytic accidents occurred among those taking the course, but no deaths: when the rabbit vaccine was replaced by goat vaccine, these disappeared completely. An account is given of the campaign to control the canine epizootic in Saigon-Cholon. The prophylaxis of *tuberculosis* is given a special section, with an account of the BCG service and tests for allergy. The whole report contains many points of interest and it is clear that Lieut.-Colonel FOURNIER and his staff have devoted themselves to much useful and interesting work.

H. J. O'D. Burke-Gaffney

CIOTOLA, A. L'Ispettorato Centrale di Sanità della Libia e la sua opera in rapporto alla patologia locale dal 1911 al 1951. [**The Central Health Inspectorate of Libya and its Work against Disease from 1911 to 1951**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1953, Mar. & Apr., v. 34, Nos. 3 & 4, 109–35; 165–97, 10 figs. & 1 folding chart. [Numerous refs.]

This is an account of the work of the Department of Medical and Health Services which came into existence when the Italians occupied Libya in 1911 and replaced the Turkish Administration which had in turn succeeded the Arabs in 1835. The last did little for the health of the local population and the Turkish Government limited itself to such quarantine and other provisions as were compulsory under International Conventions. Tripoli then had an evil reputation as a focus of infectious disease: smallpox and typhus were constantly breaking out in nomad encampments. The so-called quarantine station and isolation hospital and the civil and the military hospitals were indifferent institutions under the Turks and medical staff was very sketchy in the whole territory. The present paper claims that epidemics ceased to ravage the country from 1912 onwards. Under the Italian Administration a modern medical and public health service was gradually built up, comprising general and specialized hospitals, laboratories, district medical and sanitary staff, training schools for nurses and midwives, dispensaries and first-aid posts, quarantine stations at ports and land frontiers. Environmental services were progressively provided, including water supplies, sewerage, public cleansing, better housing and the abolition of "caravanserais" which adjoined the big towns and provided accommodation for strangers under most insanitary conditions. Control measures were taken against malaria.

Both world wars interfered with these developments but the British occupation in January 1943 adopted existing Italian institutions with as little disturbance as possible. The Central Health Inspectorate has come to an end with the declaration of Libyan independence.

The climate of Libya is more or less that of the Mediterranean sea-board. The wet season lasts from October to March and there is little rain in the rest of the year: annual rainfall averages 300 mm. [12 inches].

The effect of the Italian occupation on the health of the population is discussed and vital statistics are quoted as evidence of the progress made.

Sporadic cases are met with of various tropical diseases—ainhum, yaws, leishmaniasis, tropical ulcers—but leprosy is fairly widespread and vesical schistosomiasis is common in the Fezzan. Typhus is now said to be the only important epidemic disease and its endemic foci, mode of spread and control measures are discussed. Trachoma is a serious disabling condition and much has been done to reduce its incidence and allay its consequences. The control of malaria, plague, cholera, smallpox, tuberculosis, venereal disease, enteric and of other diseases is discussed and the results of the measures taken are briefly stated.

The paper concludes by naming various Italian medical men who were outstanding in improving health conditions in Libya. *J. Cauchi*

MAINO, M. Terminologia medica e sue voci nella lingua Somala. [**Medical Terminology as it Appears in the Somali Language**] 359 pp. 1953. Alexandria: Ferrari, Occella & C. [25s.]

WORLD HEALTH ORGANIZATION. **Summary Report on the Mecca Pilgrimage Year of the Hegira 1369 (A.D. 1950).** *Suppl. to Weekly Epidem. Record, R.E.H. No. 263*, 1952, Jan. 10, 12 pp. [In parallel French and English.] [1952/Supp./Pilgrimage.]

It is estimated that the Mecca Pilgrimage in September 1950 was undertaken by about half a million people of whom 83,936 arrived by sea, 13,659 by air and 10,834 by land; the remainder were from Saudi Arabia.

On the outward journey the general health of the pilgrims was good and their accommodation in ships was satisfactory. The only infectious disease reported was smallpox, there being one case from Pakistan and 8 from Indonesia where an epidemic of this disease was in progress at Surabayah. During their sojourn in Mecca, shortage of accommodation and absence of a piped water supply were the main problems. Disease among the foreign pilgrims was due mainly to heat stroke but also to diarrhoea, dysentery, recurrent malaria, respiratory infections and heart disease. On the return journey no epidemic diseases were reported. The arrangements for supervision at the quarantine stations at El Tor and Kamaran were satisfactory.

The improvements noted in certain ships were the appointments of lady doctors and nurses, better bunking arrangements for pilgrims and improved sea rescue appliances. Among the complaints were some of inadequate certificates of immunization and stool testing, and of overcrowding with insufficient sanitation in some ships. The large numbers of Yemen pilgrims who travel overland each year form a loop-hole in the quarantine system.

It is noteworthy that no cholera, no plague and little smallpox were recorded. *W. R. M. Drew*

WORLD HEALTH ORGANIZATION. **Summary Report on the Mecca Pilgrimage Year of the Hegira 1370 (A.D. 1951).** *Suppl. to Weekly Epidem. Record, R.E.H. No. 308*, 1952, Nov. 20, 12 pp. [In parallel French and English.] [1952/Supp./Pilgrimage 1951.]

The number of pilgrims for 1951 was estimated at 400,000 of whom 96,757 came from abroad (82,552 by sea, 12,687 by air and 1,518 by land).

On the journey to and from Saudi Arabia no cases of smallpox, cholera or plague occurred, but among the Indians in particular, dysentery, malaria, enteric and dengue fevers, skin diseases, avitaminosis and anaemia were reported. The standard of health and hygiene of Indian pilgrims was poor and this was ascribed to the high cost of living. Most of the deaths reported were due to effects of heat and senility. On the Arafat and Mena Days (11–14th September) 707 pilgrims are reported to have died of " sunstroke ". On the 18th September the Ministry of Health of Saudi Arabia declared the pilgrimage " free from infection ".

Medical certification appears to have been better than in previous years. There was overcrowding in 8 ships and sanitary arrangements were unsatisfactory in 2.

No epidemic diseases occurred on the 1951 pilgrimage. Owing to a heat wave it was found that facilities for treatment of its effects were insufficient to cope with the large number of cases. The quarantine stations at El Tor and Kamaran carried out satisfactory supervision of foreign pilgrims. After 1951 the work of the Kamaran station was taken over by the new quarantine station at Jeddah. *W. R. M. Drew*

BOOK REVIEWS

GARLAND, Hugh G. [T.D., M.D., F.R.C.P.] & PHILLIPS, William [M.D., B.Sc., F.R.C.P.]. [Edited by.] **Medicine.** Foreword by F. A. E. CREW [T.D., M.D., D.Sc., Ph.D., F.R.S.]. Vol. I. pp. xx + 1–1077. Vol. II. pp. xi + 1078–2146, numerous illustrations. 1953. London: Macmillan & Co., Ltd., St. Martin's Street, W.C.2. [£6 for 2 vols.]

It is often said that advances in medical knowledge are outstripping the capacity of the mind for integration, and certainly integration of knowledge has lagged behind the march of discovery. For this reason it is well that from time to time a team of experts should approach the situation afresh and present to the public the results of their efforts. "Our generation", state the publishers, "stands at the end of fifty years in which unparalleled advances in medical knowledge and new fields of biological and chemical investigation have exceeded in scope the researches of previous centuries. Its need is for synthesis and especially in medical studies. Each year the student and practitioner more imperatively requires, for survey or for reference, a work which will sum up the knowledge, experience and wisdom of the whole generation."

There are many excellent features of the volumes produced. The branches of medicine which have come into prominence in the last decade or so are well represented and surveyed and these include psychosomatic, industrial, social and aviation medicine, rehabilitation and the genetic factor in disease. For reasons which are discussed in the text there is often considerable reluctance in accepting psychological factors as causes of many disorders. It is appropriate therefore that this subject should be aired, and the prominence given it is welcome. The growing importance of industrial medicine is reflected in an excellent section by Dr. A. J. AMOR. Expositions of its essentials are not easy to come by and for this reason practitioners may have difficulty in familiarizing themselves with them, but the ground is here covered admirably. Similar remarks might also be made regarding genetic factors in disease which are lucidly expounded by Dr. Fraser ROBERTS. His treatment of the blood groups and their inheritance is particularly valuable. Useful chapters on neoplasms and their pathology, laboratory methods in diagnosis, and infection and immunity are included. Most practitioners after qualifying buy a text-book of medicine from time to time, but not so many provide themselves with one on pathology. Their knowledge of these important matters will be brought up to date by this portion of the work. A section is devoted to the place of radiology in diagnosis, and in this special emphasis is laid on the scope and limitations of the X-ray method of investigation. This is timely in an age in which the method is being increasingly used but in which its limitations are not always, or even generally, appreciated. The illustrations throughout the volumes are very good, but are of special merit in these sections.

The section on tropical diseases is lucidly written by Dr. A. R. D. ADAMS. In the space of 24 pages he deals with malaria, blackwater fever, kala azar, amoebic dysentery and leprosy. In another section of 18 pages Dr. W. E. KERSHAW outlines the helminthic infections most commonly encountered in temperate regions. As a matter of editorial policy the broader aspects of these subjects have not been tackled.

There can be little doubt that almost all practitioners will find in this work much with which they realize they are unfamiliar or have become out of date and their deficiencies will be greatly repaired by attention to its pages.

Nevertheless it has shortcomings. References are few and limited to general surveys only. No doubt owing to time taken between writing and publishing two volumes of this size, they are not quite up to date on certain points. In the chemotherapy of pulmonary tuberculosis, for example, no mention is made of isoniazid and the use of PAS is dismissed in 3½ lines. Subjects of which one might reasonably expect some account in two large volumes, but which are discussed in a few words or not mentioned, include megaloblastic anaemia in pregnancy, malignant malnutrition, sickle cell anaemia and myelosclerosis. In some medical text-books of similar or smaller size more information is given on these and other diseases. The practitioner confronted with an unusual case will not always find in this work the information he seeks though there is no doubt that he would be the better for knowing such as is contained. In short, it is an excellent survey of many important subjects and new developments, though as a work of reference it suffers perhaps by having so much of its space devoted to non-systemic medicine. It may not replace some of the older works but it should find an honourable place by their side. It is undoubtedly an important publication and one which will be welcome both at home and overseas.

A. W. Woodruff

ADAMS, A. R. D. & MAEGRAITH, B. G. **Clinical Tropical Diseases.** pp. x+508, 65 figs. (1 coloured). 1953, May. Oxford: Blackwell Scientific Publications, 24/25 Broad Street. [40s.]

This book was designed to give in a concise form "that information essential for the clinical diagnosis and the treatment of those diseases which occur primarily in the tropics". In 47 chapters the authors have stated the essential facts dogmatically, avoiding speculation and making no attempt at being encyclopaedic.

They have accomplished their task in an admirable fashion and their text-book will doubtless receive a warm welcome throughout all torrid countries around the globe as well as in schools of tropical medicine in temperate climes. This book is published simultaneously in Canada, Great Britain and in the United States of America.

When it transpired that a "clinical" book was being produced by workers in Liverpool many hoped for a forward-looking, speculative and even provocative volume from a team which combines ripe clinical experience with a bold imaginative philosophical outlook. The authors, however, had sensed the need for a sober, middle of the road, lightweight (lit.) handbook with no space devoted to medical history, with no bowing down to giants of the past and with no suggestions for the future. That is what they have given us. A book, soulless, perhaps, and impersonal but not arid; entirely modern with ruthless exclusion of time-honoured practices and fly-blown theories: even the binding is insect-proof.

There are no signs of tropism towards any one quarter of the globe and the book should be equally welcome in Salisbury and Singapore, in Quetta and in Quito (indeed the usually scamped South American diseases—bartonellosis, Chagas's disease and pinta—are very well described).

The arrangement of the diseases in alphabetical order—from ainhum to yellow fever—is unusual and perhaps illogical but in actual practice is remarkably convenient although at first sight the wide separation of black-water fever from malaria and of epidemic dropsy from nutritional diseases is disconcerting to the reader.

The inclusion of sections on rabies, scabies, louse-borne typhus, smallpox, phlebitis and tropical ulcer is particularly welcome as a sound knowledge of these subjects is essential for the tropical practitioner. Welcome, too, is the chapter on typhoid fever which until recently has been the most grisly spectre haunting the doctor practising in warm countries.

In a brief review it is impossible to deal individually with the many chapters on such a multitude of diseases.

The illustrations are numerous and are well reproduced—special tribute must be paid to those from Dr. Hackett's collection on yaws.

In a future edition a brief introductory chapter on the importance of universal medical diseases in tropical practice might be included with special reference to the prevalence of tuberculosis.

Inevitable delays between the submission of manuscript and the date of publication account for the absence of references to the use of primaquine in benign tertian malaria and of injectable forms of chloroquine in algid malaria but it may be said with confidence that the authors have succeeded in their object and that their book is, as far as it is humanly possible, up to date, well balanced and readable and is indeed a credit to what the publishers proudly claim to be "the oldest and probably the most distinguished school of tropical medicine in the world".

George R. McRobert

DOFLEIN-REICHENOW. **Lehrbuch der Protozoenkunde:** begründet von Franz DOFLEIN, fortgesetzt von Eduard REICHENOW. 6th Edition, Vol. 2. Spezielle Naturgeschichte der Protozoen. Part 1, Mastigophoren und Rhizopoden. [Doflein's Textbook of Protozoology: Mastigophora and Rhizopoda] pp. iv + 409–776, 393 figs. (2 coloured). 1952. Jena: G. Fischer. [DM. 20; 38s. 6d.]

Since its first publication (under the name *Die Protozoen als Parasiten und Krankheitserreger*) in 1901, Doflein brought out 3 more editions of this book, which expanded into a comprehensive textbook of protozoology (*Lehrbuch der Protozoenkunde*), and by 1916, when the 4th edition appeared, this book had an established reputation throughout the world. After Doflein's death the task of re-editing it was taken over by Prof. Reichenow, Director of the Protozoological Department at the Hamburg Institute of Tropical Medicine. The vast progress made in our knowledge of the protozoa by 1928–29 necessitated not only a complete revision but also considerable enlargement of the text, with the result that the 5th edition appeared in 3 volumes comprising 1,262 pages. Although historically associated with its founder, the *Lehrbuch* became virtually a new book, the full credit for which properly belongs to the reviser.

Like its predecessor, the 6th edition is divided into 2 sections, to be spread over 3 volumes. The first volume, which appeared in 1949, deals with the general natural history of the protozoa, while the present volume is devoted to a systematic account of the Mastigophora and Rhizopoda. Though the various groups of these protozoa are fully covered, the parasitic forms receive special attention, and—in the case of parasites of medical and veterinary importance—host-parasite relations, including pathogenesis, and epidemiology are also mentioned.

The appearance of a new edition of the *Lehrbuch* is more than welcome, for it provides the only up-to-date authoritative and comprehensive treatise on protozoology, satisfying the needs of both zoologists and parasitologists,

as well as of workers dealing with protozoal infections of man and domestic animals.

This volume is illustrated by 393 figures, and each of the two subdivisions is provided with abundant references to the literature.

C. A. Hoare

APARICIO GARRIDO, Jose & PRIETO LORENZO, Antonio. **Parasitologia y clinica de las helminthiasis.** [Helminthiasis. Parasitology and Clinical Aspects] 358 pp., 70 figs. 1952. Madrid: Editorial Paz Montalvo. [120 pesetas.]

The authors state in their Introduction that practitioners in non-tropical countries are inclined to regard helminthic infections and parasitism in general as mainly, if not purely, of tropical interest and, therefore, as not coming within their sphere of vision. Others adopt an even more cavalier attitude and tell parents, "This is of no importance; all children have worms". Both these points of view are wrong in that local practitioners are in these days very likely to be called on to treat soldiers or families returning from abroad and harbouring pathogenic helminths and they may pass on the infection to others.

This book is divided into two parts: (1) General, with 6 chapters; (2) Special, with 5 chapters. Criticism is somewhat disarmed when one reads in the Introduction that the authors "do not aspire to present anything new" and the response naturally follows, "Then, why write another book on the subject?" Reading the work, however, convinces the reviewer that the authors have been unduly self-deprecatory and though the second part, which treats of the worms individually, is on the usual lines—their description, geographical distribution, life-histories, epidemiology, clinical aspects, their pathogeny, diagnosis, prognosis, complications and treatment—the first part is exceptionally good.

The first chapter is a brief historical sketch of parasitic pathogeny from Egyptian times. Chapter II is on Helminthic Ecology, classes, orders, suborders, families, genera and species, the mode of entrance, migration and localization, with a list of the hosts—arthropods, insects, molluscs, vertebrates and aquatic plants. To this chapter is appended the more important of the rules of nomenclature. Chapter III treats of the general pathology of helminthic infections. Before describing the different pathogenic actions—mechanical, traumatic, toxic and the rest—the authors give their definitions of Infestation and Infection, with which, however, few authors of today would agree. Among British workers at all events, *infestation* is applied to the presence of parasites on inanimate objects, such as infestation of dwellings with rats or Triatomidae or clothes with lice; or, according to others, the presence of parasites on, but not penetrating, the body, as rats being infested with fleas. Others, again, regard non-penetrating forms, hookworms and *Trichuris*, for example, as infesting, on the grounds that the alimentary canal is morphologically and embryologically outside the body proper. *Infection*, on the other hand, is the term given when the parasite gains entrance into the tissues, *e.g.*, *Ascaris* larvae in the lungs, schistosomes in the liver, filarial embryos in the blood-stream. The authors, however, call infestation the presence of an infecting agent not disturbing the health of the subject, and infection as "the abnormal, harmful action" of the agent on the organism. They go on to say that "infection, a definitely harmful effect, may be of different 'modalities', namely 'inapparent', without definite symptoms [how would this be

distinguished from infestation as defined by them?]; 'latent' (inactive, but capable at any time of becoming active) and 'manifest' (causing definite symptoms)" [reviewer's translation].

Chapter IV gives an account of the biological diagnosis of helminthiasis by examination of the worms in a fresh state, or kept as permanent preparations, by faecal examination for worms or their ova (there is a good figure representing these and showing their relative sizes), by faecal culture, blood-examination, xeno-diagnosis and complement fixation. Next follows a chapter on Epidemiology and Prophylaxis, in general terms, classifying the parasites into *monoxenous*, those undergoing evolution in one species of host only, and *heteroxenous*, with an alternation of hosts of different species, the latter being subdivided into *diheteroxenous* and *polyheteroxenous* according as two or more species take part and discussing in turn the human factor, the animal factor and the environment. Prophylaxis comprises *intrinsic*, or treatment of the patient, *extrinsic*, dealing with the vectors, and *complementary measures*, such as propaganda and education. The final chapter of Part I is on Treatment; again in general terms, speaking of vermifuges as distinct from vermicides, the preparation of the patient, the mode of administration of the anthelmintic, criteria of the efficacy of treatment as regards the infection itself and of concomitant syndromes of anaemia, toxic effects, or malnutrition.

To sum up: Part I treats the subject of helminthiasis clearly, succinctly and in an eminently practical manner and this part might with advantage be translated into other languages for the benefit of those who cannot read Spanish (though the Spanish in this case is easy) and published as a separate work as an "Introduction to Helminthology". In saying this we do not intend to belittle Part II, which is also good, but there are many standard works in all languages covering the same ground, whereas we know of no such clear exposition of the subject as is to be found in Part I. Lastly, the print is good and clear, the general format pleasing, photographs well reproduced and misprints very few. The book is worthy of a better binding than the present paper cover. *H. Harold Scott*

GELFAND, Michael. **Tropical Victory. An Account of the Influence of Medicine on the History of Southern Rhodesia, 1890–1923.** With a foreword by Sir John KENNEDY [Governor of S. Rhodesia]. 256 pp., 1 folding map, 15 figs. & 17 pls. 1953. Cape Town: Johannesburg: Juta & Co., Ltd. [10s. 6d.]

The land-locked dominion of Southern Rhodesia lies in south-central Africa between the Limpopo River in the south and the Zambesi River in the north, a distance of about 460 miles; in area it is somewhat less than that of metropolitan France. In 1923, as a British territory, it attained responsible government; this book is concerned with the period of thirty years before that date which saw the encroachment of the British from Cape Colony and the diamond fields of Kimberley into a territory occupied by Matabele Bantu people who, in 1840, had been driven north from the Transvaal partly through internal dissensions in the Zulu and tributary tribes and partly through the Great Trek north from Cape Colony of the white Boer people to form eventually the Boer Republics of the Orange Free State and Transvaal. The advance northwards by the British at the instigation of Cecil Rhodes by-passed the two republics along their western edge through semi-desert terrain now known as Bechuanaland. This was the age of adventure and many European countries were involved politically

in what was known as "the scramble for Africa". Rhodes obtained concessions from the King of the Matabele for the passage through his domain of a "Pioneer Column" whose destination was Mashonaland, the plateau country south of the Zambesi River, vivid accounts of which were related by hunters such as Viljoen and Selous; geologists had also reported auriferous quartz in the Mashonaland hills, so that the quest for gold was the primary urge for the development of Mashonaland and subsequently Matabeleland, after African risings against the intruder had been quelled.

The Pioneer Column disbanded at the site of present-day Salisbury and the majority of its men dispersed to search for gold, though some preferred to take up farming; the year was 1890. In the planning of this adventure Rhodes had been forewarned by hunters and missionaries of the ravages of fever and the tsetse fly. In Dr. Leander Starr Jameson he had an active and adventurous collaborator who insisted on three young doctors accompanying the 200 pioneers who were protected by a police force of 180 men; the police medical officer, Dr. Frank Rand, played a large part in the development of the new colony at Salisbury. Dominican Sisters came north from Cape Colony to become the nursing staff of the first hospital at Salisbury; at about the same time Anglican Sisters of the English Church entered the eastern part of Mashonaland from the port of Beira in Portuguese territory. Small hospitals were also erected at Victoria on the road from Bechuanaland and at Umtali on the Portuguese border to the east of Salisbury. The medical development over the next 10 years until the outbreak of the South African war is carefully described by the author with continuous reference by name to doctors, sisters and nurses involved; the account is freely interspersed with medical anecdotes. Similar chapters are devoted to the difficulties encountered during and after the African rebellion of 1896–97.

With the turn of the century the country became known as Southern Rhodesia; it was in a sound financial position and possessed a Legislative Council and two municipalities of Salisbury and Bulawayo. The nucleus of a medical department had been formed. The public were aware of the mosquito as the carrier of malaria, of bilharzia, of scurvy and of the importance of adequate sanitation. Chapters are devoted to Malaria and Blackwater Fever, to Trypanosomiasis and to Rabies, Abortus Fever and Bilharziasis. The development of the agricultural and mining industries involves also the history of social welfare movements and the health of the African as a mine worker and in his reserves.

The book is written by a Rhodesian physician who has, quite obviously, made a detailed study of the country's medical history, and it is fitting that it should be published in the year celebrating the centenary of the birth of Cecil J. Rhodes, who was particularly fortunate in the forceful influence of medical advisers in the early days of Rhodesia; this influence persisted largely through Dr. A. M. Fleming who was the Medical Director of the territory from 1897 to 1930, and has culminated in one of the most progressive medical services in tropical countries today. Since 1930 the leading statesman of Rhodesia has been its present Prime Minister, Sir Godfrey Huggins, freely acknowledged in his day as the leader of the medical profession and its most accomplished surgeon; it is not surprising that "Tropical Victory" is dedicated to him. In these modern times of high-powered medical propaganda and action by international medical organizations it is interesting to note a remark at a Bulawayo public meeting in 1914 made by Sir Patrick Manson: "Health is everything to you, and the public health is everything to the prosperity of your adopted country".

Over 400 individuals are referred to by name in 250 pages; it makes rather heavy reading, except to those familiar with Rhodesia, but this is relieved by the liberal sprinkling of anecdotes. *R. Ford Tredre*

CALVERLEY, Eleanor T. [M.D.]. **How to be Healthy in Hot Climates.** 2nd Edition. pp. vi + 286, 3 pp. of maps. 1953. New York 16: Thomas Y. Crowell Co., 432 Fourth Avenue. [$3.50.]

In the third printing (1953) of this book a few new items have been included, but most of the text remains the same as in the first edition. Many of the alterations are in the chapter on Food and Health, and these are not extensive, though there are new tables of food.

This means that the most recent experience of some of the tropical diseases is not included. For instance, the modern tendency to include mepacrine in the treatment of malaria with proguanil is not mentioned, or the use of streptomycin in plague.

Nevertheless, the book remains a useful and comprehensive guide, and it has evidently proved popular. *Charles Wilcocks*

MORTON, Leslie T. [A.L.A.]. **How to Use a Medical Library. A Guide for Practitioners, Research Workers and Students.** 2nd Edition. pp. vii + 44. 1952. London: William Heinemann Medical Books Ltd., 99, Great Russell Street, W.C.1. [5*s*.] [This review appears also in *Bulletin of Hygiene*.]

The first edition of Mr. Morton's very informative guide to the use of a medical library appeared in 1934. This second edition has been brought up to date, and very largely rewritten, with additional chapters on the development of medical periodicals and on abstracting services. Its object is to give a brief account of the most important reference books and serial publications dealing with medical literature, and to make it easier for research workers and students to use a medical library to the best advantage. It gives helpful advice also on the compilation of medical bibliographies. A final chapter contains a list of the principal medical libraries in Britain, arranged geographically, with short informative notes on the number of books and periodicals they contain, and on their policy in regard to allowing the use of their collections to members and other readers. *R. L. Sheppard*

GRAY, Peter [Ph.D., D.I.C.]. **Handbook of Basic Microtechnique.** pp. viii + 141, 57 figs. 1953. London: Constable & Co., Ltd., 10, Orange Street, W.C.2. [12*s*. 6*d*.]

This manual consists of histological recipes and other practical instructions in the art of preparing tissues for the microscope. References, theories and interpretations are left for a larger work which has not yet been published; and by means of this segregation it has been found possible to give much detail in a self-explanatory fashion, so that it is easy to remember, within the modest bulk of 140 pages. In the section on the razor, for instance, matters pertaining to the mystery of the craft here become so logical that it seems possible even for a medical man to obtain a sharp edge. That would be a delusion of course, but one that indicates the success of the writing which makes complicated processes seem easy to the student. It is a teacher's book; but it is not limited to any single branch of the biological

sciences. Accurate and thorough though the instruction is, it is perhaps spread over too large a field. Microtechnique, however basic, tends to vary with the science employing it; and there is bound to be a slight "lucky dip" atmosphere in any book of this size which includes the Ziehl-Neelsen staining of sputum, the preparation of a transverse section of a root and the mounting of arthropods. *G. L. Robinson*

PFISTER, R. **Guide pratique pour le diagnostic et le traitement des filarioses humaines en A.O.F.** [Practical Guide for Diagnosis and Treatment of Human Filariasis in French West Africa.] 79 pp., 6 pls. 1952. Dakar: Direction Générale de la Santé Publique, A.O.F.

This publication is in the form of a practical handbook on filariasis, mainly designed, so it seems, for laboratory workers.

Written in telegraphic style it deals with the biology and morphology of the parasites, vectors, clinical features, and diagnosis and treatment of *D. perstans*, *D. streptocerca*, *L. loa*, *W. bancrofti*, *O. volvulus* and *Dracunculus medinensis* infections.

There are some useful tables presenting diagrammatically the appearances and size of the adult worms, and outline figures of microfilariae of *W. bancrofti* and of the embryos of the other species mentioned.

The illustrations include a distributional map and schemes of life-cycles. Well printed and produced, the book undoubtedly serves the purpose for which it was intended and should prove a useful *vade mecum* for laboratory workers in West Africa. *Philip Manson-Bahr*

JUNGE, Werner. **African Jungle Doctor. Ten Years in Liberia.** 208 pp., frontispiece, 1 map & 21 figs. on 14 pls. 1952. London: George Harrap & Co. Ltd., 182, High Holborn, W.C.1. [15*s*.]

Conditions in Liberia are not yet well known outside that country, and reliable information on them is therefore to be welcomed. Dr. Junge's book, however, is not an account of the health of the country, but the story of his own experiences of the people and, only incidentally, of their diseases. Readers will not know much more about the incidence of disease, though some of the descriptions of epidemics are vivid enough, but they will know a lot more about the country and its inhabitants, and about the author. What they learn from the book will please all but the cynics. The author obviously believes that the people he worked for have many virtues, of heroism and humour, and few vices; above all, they are friendly and companionable. Doctors who have had close dealings with the Africans, especially those who have left Africa and whose memories have lost the minor irritations, will respond to this intelligent and human approach, and to this attractive writing. Dr. Junge lived a hard and strenuous life and enjoyed every minute of it; he has produced one of the best books of reminiscence. *Charles Wilcocks*

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